M3291/3295

Server Management Daughter Card
& Tyan System Operator

Revision V2.00

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M3291 Box Contents

The retail M3291 package should contain the following:

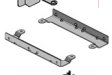
1 x TYAN System Management Daughter Card

1x 50-pin Ribbon Cable

1 x Serial-to-Serial Cable

1 x Standard PCI Bracket

1 x Low Profile PCI Bracket


1 x HD Bay Bracket (Option)

1 x SMDC & TSO User's Manual(Option)

1 x TYAN TSO CD

M3295 Box Contents

The retail M3295 package should contain the following:

1 x TYAN System Management Daughter Card

1 x SMDC & TSO User's Manual(Option)

1 x TYAN TSO CD

If any of these items are missing, please contact your vendor/dealer for replacement before continuing with the installation process.

About this Manual

This manual is designed to provide the basic information for the SMDC M3291/3295. It includes the introduction of hardware, software and general troubleshooting procedures.

Chapter 1: Overview – Includes the basic introduction of SMDC, TSO, OPMA and M3295, and Server Management.

Chapter 2 and Chapter 3: M3291, M3295 Hardware Information – Introduces the hardware information, including card features, specification, components, jumper setting and installation procedure.

Chapter 4: Software Installation – Introduces details on how to install software, update firmware and configurations, as well as introducing some open source IPMI software.

Chapter 5: TSO Information – Introduces the software information of TSO (Tyan System Operator), including features and how SMDC and TSO work.

Chapter 6: Troubleshooting – Provides the general troubleshooting procedures the users will meet in their daily work, effectively reducing the problems happened in the process of server management.

Chapter 1: Overview

Servers today provide the necessary resource for corporate databases, financial and statistical analysis data, military defense networks, and much more. To act as the heart and soul of any network, servers must be infallible or near infallible. There must be competent management of IT resources at all times in order to keep servers and networks running smoothly and without incident. However, most network and server administration staff can just provide part of that support, they cannot be present 24 hours a day, 7 days a week, on a constant 365-day calendar.

To help provide a solution for constant vigilance, the server remote management card eliminates the problem of having an administrator on call at all times. Tyan has the entire package to manage servers and networks. This makes the Tyan solution one of the most complete IT resource tools available.

1.1 What are SMDC?

The Tyan Server Management Daughter Card **(SMDC)** is a powerful, yet cost-efficient, solution for high-end server management hardware packages. The SMDC provides remote system monitoring and control even when the operating system is absent or fails, and empowers server boards with advanced industry standard features. It effectively enables IT Managers to have remote and multi-interface access to **monitor**, **control**, and **diagnosing** activities.

The SMDC is powered by an intelligent controller known as the Baseboard Management Control **(BMC)**. The BMC is a standalone mini-CPU that runs on its own Real Time Operating System **(RTOS)** to complete a variety of tasks. Backed by Renesas reliable H8 technology, systems are consistently monitored and supported.

Unlike regular cards such as AGP cards, network cards or SCSI cards, the SMDC is not a peripheral card that requires any hardware specific driver. As long as standby power supports the system, the SMDC will monitor the system.

The Tyan SMDC M3291/3295 provides many diverse methods to communicate with the hardware. There is flexibility to choose among *Keyboard Controller Style **(KCS)**, Intelligent Platform Management Bus **(IPMB)** and standard IPMI-Over-LAN* communication as defined in latest IPMI 2.0 specification. The Tyan SMDC M3291/3295 is compatible with all IPMI-compliant software as well as with the Tyan System Operator™ (TSO) 2.0 software package. The SMDC hardware is OS-independent and TSO is fully compatible with all major Operating Systems.

1.2 SMDC and TSO

The TSO is software made by Tyan which acts as a front end client that provides additional functionality for the SMDC. The SMDC and TSO offer remote management over servers. The remote management gives the ability to monitor and control remote resources, such as temperature monitoring, fan control, turning system on/off, or modifying system settings remotely.

1.3 OPMA and M3295

OPMA stands for **Open Platform Management Architecture** which is initiated by AMD. It defines a common hardware interface between the server platform and its server management subsystem.

M3295 is OPMA compatible card. It's also compatible with IPMI 2.0 and has dedicated management NIC support. Dedicated management NIC provides high performance and reliability.

	M3291	M3295
Interface	Tyan 2X25 Connector	AMD OPMA
Management NIC	Side-band(Shared)	Dedicated

The specification is available for download from AMD website
http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_8796_12498,00.html

OPMA spec defines three basic sets of functionality labeled M1, M2, and M3.

M1—The Value Solution
• Main feature = price
• IPMI 1.5 compatible
• No dedicated manageability NIC
M2—Reasonable Price with Security and Performance
• M1 base features plus dedicated management NIC
  − Provides high performance and optimal security
• Access to hardware health data through BMC-based web server
  − Implies a more powerful BMC CPU core, larger address space, more flash and RAM
• Remote virtual mass storage
M3—High-End Solution with Graphics Console Redirection
• Features of the M3 functional tier are M2 plus KVMoIP*.

*KVMoIP---Keyboard, Video, and Mouse over Internet Protocol. Used for implementing remote video consoles on headless (i.e., no local keyboard mouse or display) servers.

1.4 Features of Tyan Server Management

Monitor various system components remotely
-such as fans, processor temperature, and more

Remote power on and power off

Console redirect
-the ability to view system remotely

Alert and error actions
-such as audible beep, e-mail, power down and reboot

SMDC runs on stand-by power
-the SMDC will continue to function, even if the system is not powered on

General Features of SMDC

Feature	Description
BMC	Renesas H8 2167
IPMI	Version 2.0 Spec
FRU	“Field Replaceable Unit” Information Storage
SDR	Sensor Data Record
SEL	Sensor Event Log
GPIO	“General Purpose Input and Output” lines for future expansion.
IPMB	Intelligent Platform Management Bus
IPMI-Over-LAN	Remote sensor monitor, host control and system diagnose
Remote Host Control	Power up, down, reset, power cycle or NMI through LAN port
Remote Sensor Monitor	SMDC provides sensor information as long as BMC receives enough operating power.
Remote Diagnostic	SMDC allows for system diagnostic when the system is not in operation (both intentionally or accidentally) through remote IPMI command execution.
BMC Firmware Update	SMDC supports onboard update of the BMC firmware.
ASF	Alert Standard Forum
TSO	Tyan System Operator ™

The SMDC M3291/3295 is equipped with the following features:

Hardware Monitoring
Protocol and Standard
Enhanced Authentication
Encryption Support

Firmware Firewall
Auxiliary Communication Interface
Auxiliary SMBus / I^2C buses
Teamed with other IPMB Devices (PMCs and EMCs)
Remote Monitor, Control and Diagnostics
Remote Console Redirect over LAN(SOL)
Sensor Data Record
System Event Log
Field Replaceable Unit Information Storage
Upgrade BMC firmware
"Always Ready"
TYAN System Operator ™ (TSO)
Standard or OEM Drivers

Hardware Monitoring
The latest hardware from TYAN is equipped with Baseboard Management Controller (BMC) from Renesas H8 which provides not only system monitoring but also remote manageability. The BMC can always monitor the hardware regardless of how the operating system is running. With the BMC onboard, any IPMI-compliant software can monitor, control or diagnose the hardware locally, or from a remote site.

Protocol and Standard
- Intelligent Platform Management Interface (IPMI) 2.0
- Remote Management and Control Protocol (RMCP) for IPMI-Over-LAN
- Alert Standard Forum (ASF)

Auxiliary Communication Interface (Other standard devices that the SMDC communicates with)
- IPMB = Intelligent Platform Management Bus
- LAN = Local Area Network

Enhanced Authentication
Support new algorithms that provide more robust key exchange process for establishing sessions and authenticating users.

Encryption Support
IPMI message and other payload carried over RMCP+ can be encrypted. This enable confidential remote configuration of parameters such user passwords and transfer of sensitive payload data over SOL.

Firmware Firewall
Firmware Firewall is the name for a collection of commands that enable a BMC implementation to restrict the ability to execute certain commands or functions from a given interface. This can be used to protect against operations that errant or malicious software may used to affect the managed system or other systems.

Auxiliary SMBus / I^2C buses

The SMDC provides 4 dedicated and independent buses for user expansion. Many devices including Northbridge, Southbridge, Super I/O, Hardware Monitor, LAN controller, etc., provide I^2C communication. These I^2C buses bridge the proper communication between these devices.

Teamed with other IPMB Devices (PMCs and EMCs)
Numerous devices in the market already support IPMB communication. BMC facilitates the control and management of these devices. PMC stands for Peripheral Management Controller and EMC stands for Enclosure Management Controller.

Depending on the overall set up of the system, the SMDC could initialize and communicate with other PMC/EMC residing on the same IPMB bus. Simply connect the devices to the designated IPMB connector. Available PMC/EMC options include:

- Satellite controller - SCSI RAID controller unit
- Power supply - power supply unit that has a hardware monitoring chip inside

Remote Monitor, Control and Diagnostics
Sensor Monitor

- Voltage
- Temperature
- Tachometers
- Fan Speed Control / PWM
- Chassis Intrusion

Control Command Set

- Power Up
- Power Down
- System Reset
- System Power cycle
- System NMI
- Watchdog Timer

Diagnostic Command Set

- Power-Good Detection
- CPU Voltage Identification (CPU VID)
- ACPI State Detection
- Request Message Redirection through IPMB
- Remote Console Redirection over LAN

Remote Console Redirect over LAN
Remote Console Redirection allows IT managers to effectively control and maneuver text console of a remote machine. Serial console information goes through the M3291/3295 SMDC and is processed over the network. TSO software then reproduces the exact text console at a remote location. For example, someone may own a group of servers at a remote location and could change options of those servers from a completely separate location. Another example is that one may log in to the Linux serial console through M3291/3295 SMDC over the network.
See SMDC installation section for details.

Sensor Data Record (SDR)
Each sensor has its own corresponding characteristics. They are built according to IPMI standard to provide users the most information possible about a sensor. Details such as measuring units and calibration factors are available while they are not provided in traditional hardware monitoring systems.

SDR is specific to motherboard. Tyan provides a utility to easily upgrade the BMC firmware to support each motherboard model.

System Event Log (SEL)
A complete history of system events such as POST events are stored and secured in non-volatile memory. Critical events within the server detected by the BMC are recorded in the SEL. Certain pre-programmed actions may take place such as system reboot or system shutdown.

Field Replaceable Unit Information Storage (FRU)
Chassis, Board, Product and other important service information are stored and secured in an area generally known as FRU.

Upgrade BMC Firmware
The BMC supports Firmware Flash through IPMI firmware commands. The Firmware is stored in boot block flash part. The boot block section code is normally programmed in-factory and it provides protection against accidental flash failure or power loss.

BMC Firmware may be upgraded from a remote console running Tyan System Operator (TSO). See TSO section for details.

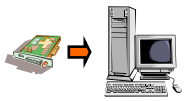
"Always Ready"
SMDC runs on stand-by power; all monitoring and alerting operations of BMC can begin full operation by using only standby power.

Tyan System Operator ™ (TSO)
TSO is a software tool created specifically for IPMI-compliant systems with SMDC. It intends to provide IT managers the ability to monitor, control and diagnose their Tyan server boards with ease and flexibility in a remote configuration. See *Chapter 3: Software Information* for further details.

Standard or OEM Drivers
M3291/3295 can use standard IPMI driver on Windows on LINUX.
Tyan may provide driver support for other third party software at request. Contact your Tyan support representative for more details.

1.5 How SMDC and TSO work

The brief descriptions below will help explain how these items function. For further, more in-depth descriptions, please refer to *Chapter 3: Software information*.

	Agent – a system with SMDC installed The SMDC is installed in the Agent system that uses a compatible/supported Tyan motherboard.
	Manager – manages the Agent The Manger is set up to manage the Agent that has the SMDC. The Manager and Agent should be in same subnet.
	Console – communicates with Manager The Console is used to monitor and control the Agent through the Manager.

1.6 Operating System Compatibility

SMDC is OS-independent.
And TSO, the remote management software is compatible with the following operation systems:

Microsoft®
Windows® 2000
Windows® XP (32/64-bit)
Windows® Server 2003 (32/64-bit)

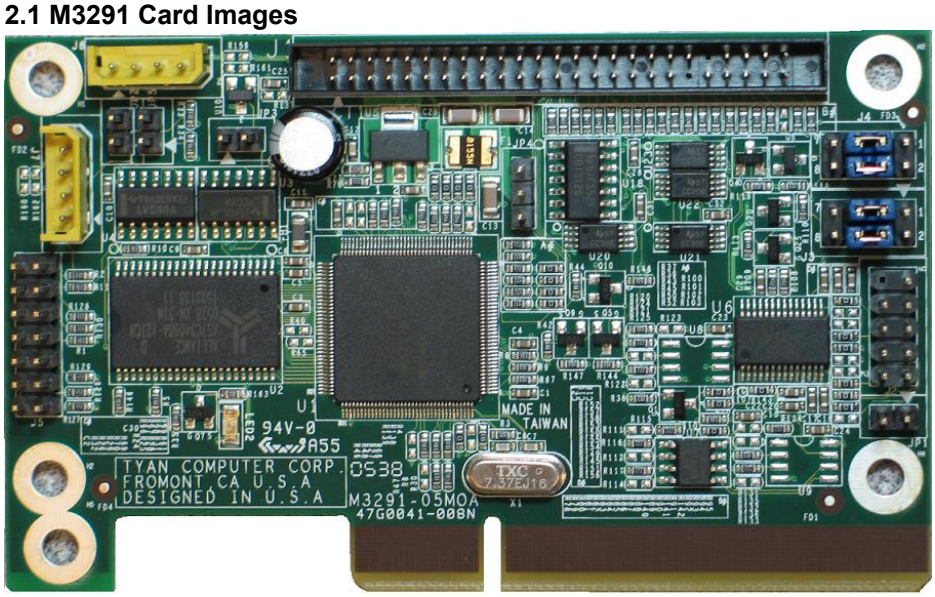
Red Hat®
RH Linux 7.2, 7.3, 8.0, 9.0 (32/64-bit)
Adv. Server 2.1, 3.0, 4.0 (32/64-bit)

SuSE®
SuSE Enterprise Server 8.0, 9.0 (32/64-bit)
Professional 9.0, 9.1, 9.2,9.3,10.1 (32/64-bit)

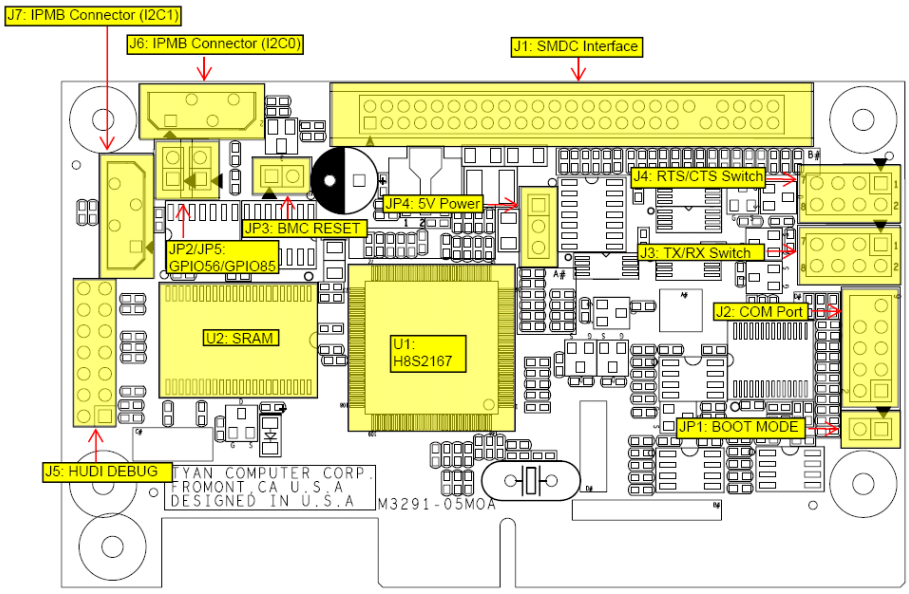
TYAN reserves the right to add support or discontinue support for any OS with or without notice.

Chapter 2: M3291 Hardware Information

2.1 M3291 Card Images



2.2 M3291 Card Layouts



2.3 M3291 Jumper Setting

Label	Header Type/Part	Description	Pin Layout	
J1	HDR25X2_SVM_A	SVM Edge Connector A		
J2	COM Port	Signal remapped for M/B COM2 (9Pin GND)	Pin 1	DTR
			Pin 2	DTR
			Pin 3	TX
			Pin 4	CTS
			Pin 5	RX
			Pin 6	RTS
			Pin 7	NC
			Pin 8	NC
			Pin 9	GND
J3/J4	TX/RX Switch RTS/CTS Switch	BMC Serial redirect	3-5,4-6 Close	BMC serial connects to J2
			1-3,5-7, 2-4,6-8 Close	BMC serial connects to Serial MUX
J5	HUDI	For ICE debug use		
J6	IPMB Connector	Connect with I2C0 of BMC	Pin 1	SDA
			Pin 2	GND
			Pin 3	SCLK
			Pin 4	NC
J7	IPMB Connector	Connect with I2C1 of BMC	Pin 1	SDA
			Pin 2	GND
			Pin 3	SCL
			Pin 4	NC
JP1	HDR2	BOOT Mode	Close to set BMC in Boot Mode	
JP2	HDR2	GPIO56	Pin 1	GPIO56
			Pin 2	GND
JP3	HDR2	BMC Reset	Close to Set BMC in Reset	
JP4	HDR3	5V power backup	Pin 1	GND
			Pin 2	5V
			Pin 3	GND
JP5	HDR2	GPIO85	Pin 1	GPIO85
			Pin 2	GND

2.4 M3291 Card Installation

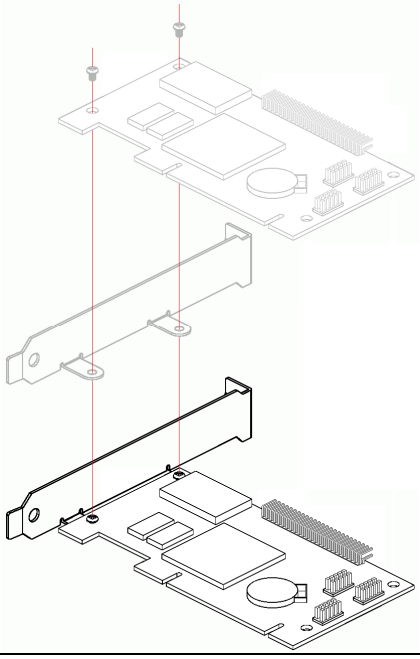
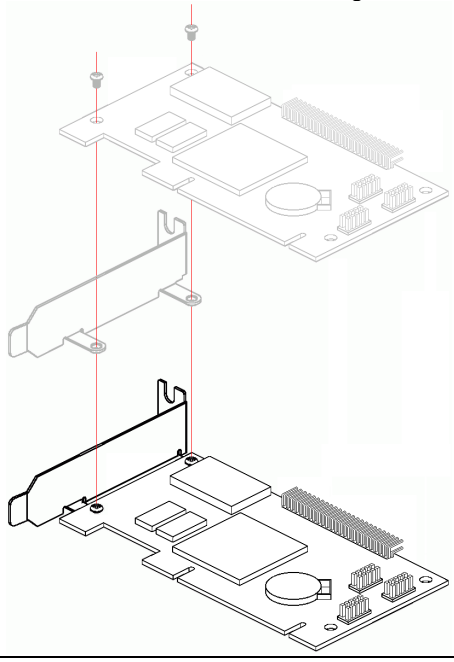
Before you begin, please take the following precautions:

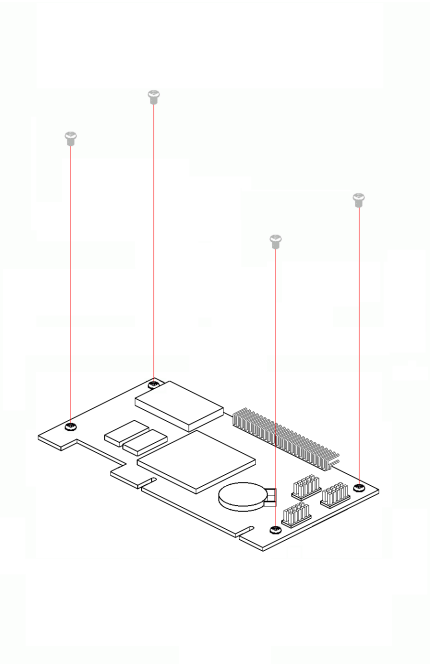
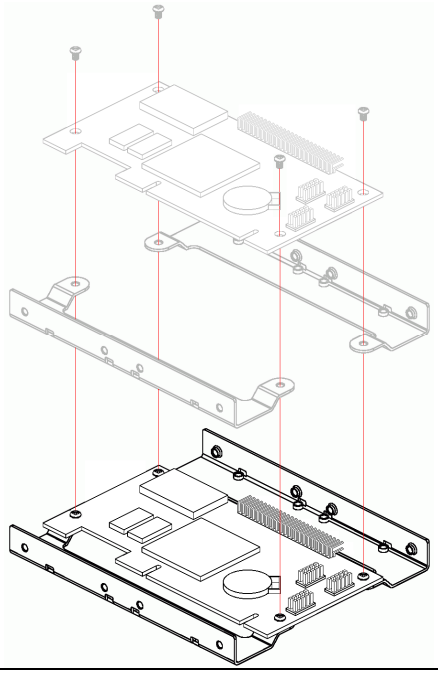
(1) Ground yourself properly before removing the SMDC from the antistatic bag. Unplug the power cord from your computer power supply and then touch a safely grounded object to release static charge (i.e. power supply case). For the safest conditions, TYAN recommends wearing a static safety wrist strap.
(2) Hold the SMDC by its edges and do not touch the bottom of the card.
(3) Avoid touching the SMDC components such as IC chips or connectors.
(4) Place the SMDC on a grounded antistatic surface or on the antistatic bag that the board was shipped in.
(5) Inspect the card for damage.

Note: This installation guide assumes that the user has already completed installing their motherboard and chassis.

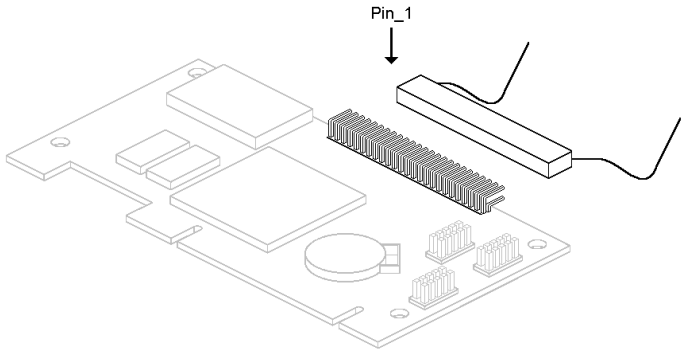
You can install the SMDC card to your motherboard in three easy steps. Make sure your system is powered off first.

Step 1:
Find the dedicated location to mount the SMDC.
There are four possible ways to mount the SMDC card.

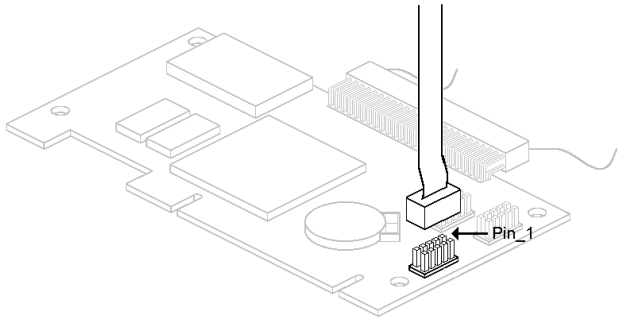
1. Full-size PCI bracket mounting solution	2. Half-size PCI bracket mounting solution
	

3. Direct mounting to TYAN Chassis solution	4. Hard Driver size bracket mounting solution
	

Step 2:
Connect 2x25 ribbon cable between **Tyan motherboard SMDC connector** and **Tyan SMDC J1**.
Make sure that the key on the ribbon cable aligns with the key on the connector, and that the red line on the ribbon aligns with pin 1 of the connector.



Step 3:
Connect 2x5 ribbon cable between **Tyan motherboard COM2 connector** and **Tyan SMDC J2. (**Check with www.tyan.com SMDC FAQ for J2 connector**)**
Make sure that the key on the ribbon cable aligns with the key on the connector, and that the red line on the ribbon aligns with pin 1 of the connector.

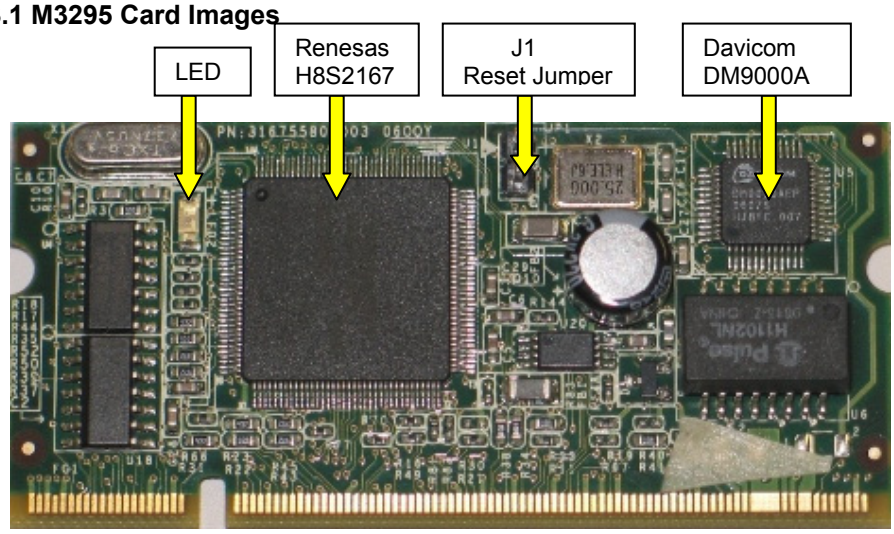


Step 4:

Locate the onboard **"SMDC-Link" Network Interface Controller** (NIC) on Tyan motherboard. **(**M3291 uses one of motherboard onboard NIC for **IPMI out-of-band**. Before using, please make sure which port M3291 used.
You can refer to http://www.tyan.com/support/html/faq_tso.html motherboard Illustration Picture**)**

Chapter 3: M3295 Hardware Information

3.1 M3295 Card Images



3.2 M3295 Jumper Setting

Label	Header Type/Part	Description	Pin Layout	
J1	Reset	M3295 BMC Reset Jumper		

3.3 Card Installation

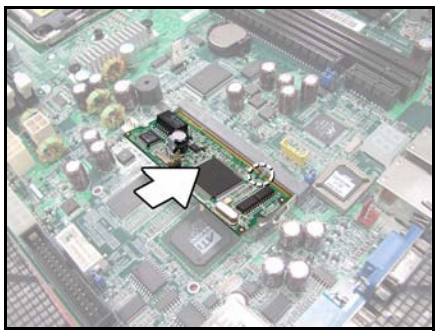
Before you begin, please take the following precautions:

(6) Ground yourself properly before removing M3295 from the antistatic bag. Unplug the power cord from your computer power supply and then touch a safely grounded object to release static charge (i.e. power supply case). For the safest conditions, TYAN recommends wearing a static safety wrist strap.
(7) Hold M3295 by its edges and do not touch the bottom of the card.
(8) Avoid touching M3295 components such as IC chips or connectors.
(9) Place M3295 on a grounded antistatic surface or on the antistatic bag that the board was shipped in.
(10) Inspect the card for damage.

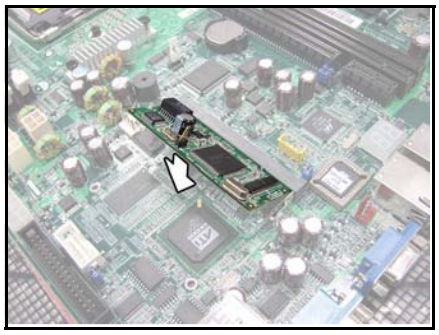
Note: This installation guide assumes that the user has already completed installing their motherboard and chassis.

You can install M3295 card to your motherboard in three easy steps. Make sure your system is powered off first.

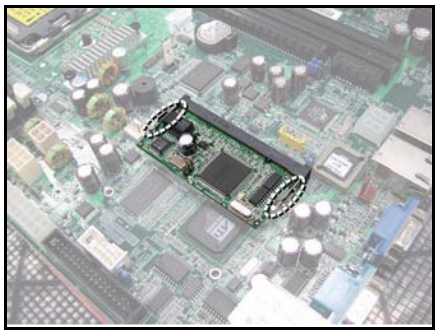
Step 1:
Insert the card with a degree about 45º into the OPMA socket on the motherboard.



Step 2:
Press down the card into the socket.



Step 3:
When properly seated, the retention clips lock into position.



Chapter 4: Software Installation

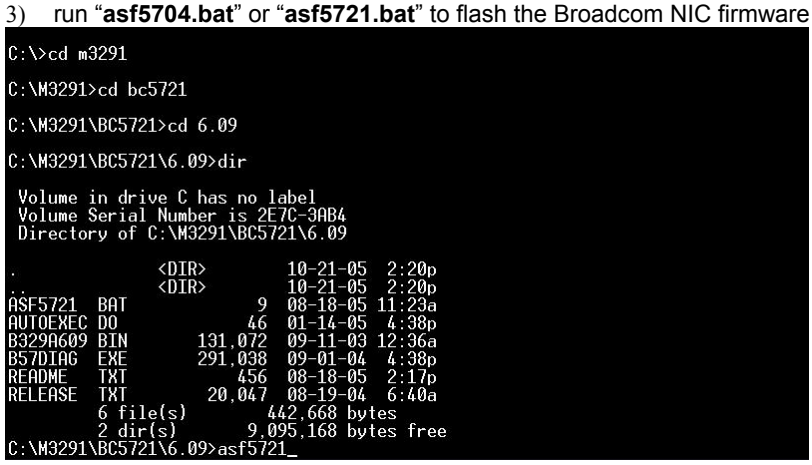
4.1 - Firmware Update

1. Verify/flash **Tyan motherboard system BIOS with the SMDC support**
M3291/M3295 need BIOS support. So before using M3291/3295, please make sure BIOS you used is IPMI enabled. If not, please update BIOS first.
Users can refer to http://www.tyan.com/support/html/faq_tso.html SMDC Support List
If you wan to know the detail about BIOS for IPMI, please refer the M3291/3295 FAQ.

2. Broadcom NIC Firmware Update

It's M3291 only. M3295 use dedicated NIC. So there's no such requirement for M3295.
Some motherboards use Broadcom NIC as IPMI side-band NIC. User must load Broadcom NIC ASF firmware to enable the IPMI function. Users can get them from M3291/3295 Driver CD or Tyan website.

1) copy all file to floppy
2) boot to DOS
3) run "**asf5704.bat**" or "**asf5721.bat**" to flash the Broadcom NIC firmware



4) After flashing finish, choose [9] save and exit

```
File Name   : b329a609.bin
File Size   : 131072
Offset      : 0x0000
Bytes Read  : 131072
Restoring original MAC address 00-E0-81-2E-09-6C
Reading current NVRAM ... OK
Restoring original Serial Number: 0123456789
Programming... 131072

loading data from NVRAM

0.  Save to file
1.  ASF Settings
2.  ASF Alert Info
3.  ASF Alert Data for Legacy Sensors
4.  ASF Remote Control Data
5.  ASF Capabilities Supported
6.  ASF SMBus Addresses
7.  ASF 2.0 (Secure RMCP)
8.  SMBus Init Data
9.  Save and Exit
10. Exit without Saving
  ter your choice -> 9_
```

3. M3291/3295 Firmware Update

When M3291/3295 production, it will load one default firmware. But it's impossible to fit every motherboard. So before using M3291/3295, User also need update M3291/3295 motherboard specified firmware.
M3291/3295 Driver CD contains the firmware file. User also can get the latest firmware from Tyan website.
Tyan provide both DOS and Linux utility for firmware updating. The firmware release packages include these two utility already. User only need execute "**dosfls**" or "**./linuxfls**"

```
5350R09  BIN       374,664  09-15-05  6:24p
5350R07  SDR         5,613  08-29-05 12:03p
TY5350~2 SDR         5,613  08-29-05 12:03p
UH8L                49,940  09-15-05 10:26a
DOSFLS   BAT            62  10-21-05  2:30p
LINUXFLS                68  08-31-05  4:39p
UH8D     EXE        80,086  08-29-05  7:46p
         8 file(s)        522,386 bytes
         2 dir(s)       9,089,024 bytes free

C:\M3291\S5350\REV09>dosfls

C:\M3291\S5350\REV09>uh8d /sdr=5350r07.sdr /nrst
BMC Utility on Dos For M3291 version 0.1
Copyright 2005 TYAN Computer Corp.
writing SDR......
Update successfully

C:\M3291\S5350\REV09>uh8d /rom=5350r09.bin
BMC Utility on Dos For M3291 version 0.1
Copyright 2005 TYAN Computer Corp.
Update Firmware with File 5350r09.bin
Enter Downloader......OK
............_
```

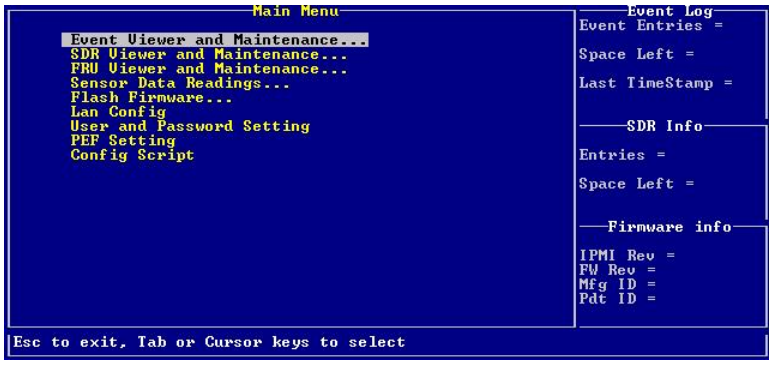
```
[root@RAPHAEL-RH8 rev09]# ll
total 0
-rwx------    1 root     root         6340 Sep 15 14:01 3291note.txt
-rwx------    1 root     root       374664 Sep 15 18:24 5350r09.bin
-rwx------    1 root     root           62 Oct 21  2005 dosfls.bat
-rwx------    1 root     root           68 Aug 31 16:39 linuxfls
-rwx------    1 root     root         5613 Aug 29 12:03 ty5350r07.sdr
-rwx------    1 root     root        80086 Aug 29 19:46 UH8D.EXE
-rwx------    1 root     root        49940 Sep 15 10:26 uh81
[root@RAPHAEL-RH8 rev09]# ./linuxfls _
```

4.2- Configuration

Before using M3291/3295, users need do some configuration first, such as IP Address. Otherwise some IPMI function won't work. Users can use the standard IPMI software to set. And Tyan also provide some utilities to do them.
The most important configuration are **LAN Configuration** and **User Password** Setting. File "**m3291.cfg**" contains the default setting value of M3291/3295. User can use utility to load this configuration file and restore the M3291/3295 default setting.

Tyan provide following utilities.

1) **UH8.EXE**
   M3291/3295 Full Version Utility on DOS. \
   It supports SEL, SDR, FRU, SENSOR viewer and editor.



2) UH8D.EXE

M3291/3295 Thin Version Utility on DOS

It support do configuration via command line.

"uh8d /?" for the detail usage.

```
C:\M3291>uh8d /?
BMC Utility on Dos For M3291 version 0.2
Copyright 2005 TYAN Computer Corp.
Usage: uh8d [option]
/?                      Display this help screen
/h                      Display this help screen
/rom=filename           Update firmware with the specified file
/sdr=filename           Update sdr with the specified file
/cfg=filename           execute configuration file
/dhcp                   Enable DHCP
/sp1[=xxx]              Set the password of user id 1
/sp2[=xxx]              Set the password of user id 2
/sp3[=xxx]              Set the password of user id 3
/sp4[=xxx]              Set the password of user id 4
/d                      Display the LAN Configuation
/ip=xxx.xxx.xxx.xxx      Set IP Address
/mac=xx:xx:xx:xx:xx:xx  Set MAC Address
/net=xxx.xxx.xxx.xxx    Set Net Mask
/gateway=xxx.xxx.xxx.xxx        Set gate way
/arp=0/1                Enable/Disable Gratuitous ARP
/seldump=filename       Dump SEL to the specified file
```

3) UH8L

M3291/3295 Utility on Linux.

It use its own user space driver. So don't use any other IPMI driver when using this utility

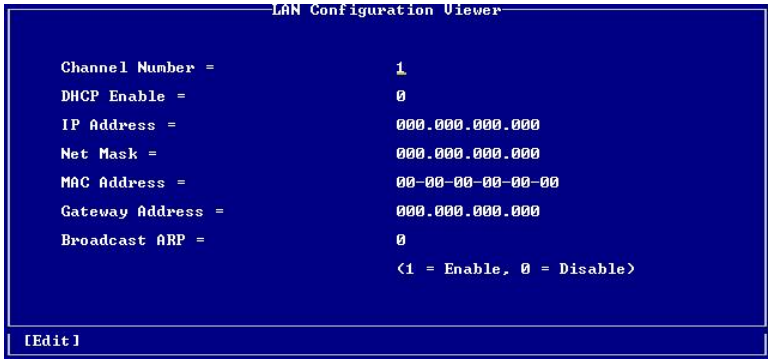
"./uh8l –h" for detail usage.

```
BMC Utility on Linux For M3291 version 0.8
Copyright 2003-2005 TYAN Computer Corp.
Usage: uh8l [-?] [-h] [-u filename] [--spx[=xxx]] [-d] [-i ipaddr] [-m macaddr]
[-e Net/LUN CMD DATA]
-?                      Display this help screen
-h                      Display this help screen
-u filename             Update firmware with the specified file
--sdr filename          Update sdr with the specified file
--cfg filename          execute configuration file
--dhcp                  Enable DHCP
--sp1[=xxx]             Set the password of user id 1
--sp2[=xxx]             Set the password of user id 2
--sp3[=xxx]             Set the password of user id 3
--sp4[=xxx]             Set the password of user id 4
-d                      Display the LAN Configuation
-i xxx.xxx.xxx.xxx      Set IP Address
-m xx:xx:xx:xx:xx:xx    Set MAC Address
-n xxx.xxx.xxx.xxx      Set Net Mask
-g xxx.xxx.xxx.xxx      Set gate way
--arp=0/1               Enable/Disable ARP
-a                      Auto check and set the ip address
   Util will read the MAC Address from BMC and check whether it exist on mother
board.And auto set the BMC IP Address with the system ip address if found
-e Net/LUN CMD DATA     Execute IPMI command
[root@2723-RH72 uh8l]# _
```

4) **UH8W.EXE**
M3291/3295 Utility on Windows
UH8W.EXE depends on the Intel IPMI Reference Driver. So users must install it when using this utility.
About Intel IPMI Reference Driver installation, please refer to M3291/3295 FAQ.

1. LAN Configuration

1) **IP Address**
Users can set M3291/3295 IP Address as they want. Following is the instruction about how to set IP with Tyan utilities.
"uh8d /ip=xxx.xxx.xxx.xxx"
"./uh8l –I xxx.xxx.xxx.xxx"
"uh8w /ip=xxx.xxx.xxx.xxx"



2) **M3291 MAC Address**
Normally user need not set MAC address, but users need check if the MAC address is right.
For Intel 82551 and 82546 NIC, M3291 use the same MAC address with system OS. Tyan IPMI enabled BIOS will load it automatically. If not, user can set it manually
For Broadcom 5704 and 5721 NIC, M3291 use the different MAC address with system OS. Every M3291 will be assigned one unique MAC when production. When users flash firmware, parameter "imac" will load this MAC from M3291 and write to LAN Configuration.

3) **M3295 MAC Address**
M3295 uses dedicated management NIC. So user need not set MAC address also. Parameter "imac" is Tyan utility also can be used to load M3295 MAC and write to LAN Configuration.

4) **Net Mask, Gateway and Broadcast ARP**
Users need check if these parameter are correct.
If use Intel 82551 and 82546 as IPMI NIC, Broadcast ARP must be enabled

5) **DHCP**

Due to NIC hardware limitation, not all the IPMI NIC support DHCP. Right now, only Broadcom, Intel 54x/56x/57x and M3995 dedicated LAN support DHCP.

5) **Broadcom NIC 2nd MAC mode**
On Broadcom NIC, M3291 use the 2nd MAC address mode. It's to say, M3291 use different MAC with system OS. You can take them as different logical entity, they use different MAC, different IP. But they share the same physical port.

2. User Password Setting

M3291/3295 default supports 5 users:

NULL User ID 1, user name is empty
Operator User ID 2
Admin User ID 3
Callback User ID 4
User. User ID 5

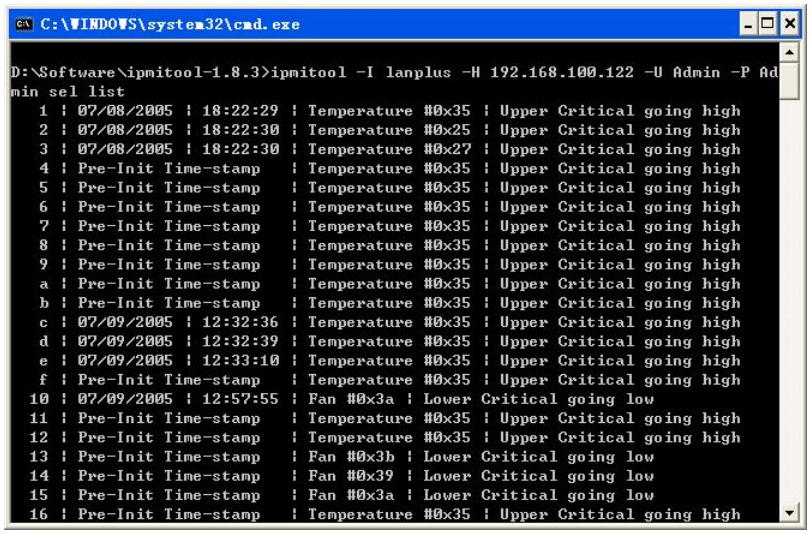
Their default passwords are same with the user name.
Users can change M3291/3295 username and password as they want.
But Tyan utility only support user password changing.

4.3- Open Sourced IPMI Software

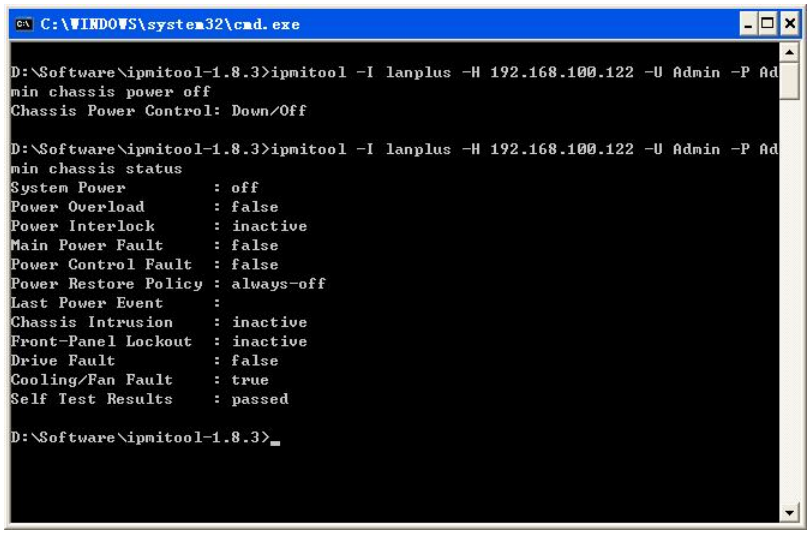
1. IPMITOOL

IPMITOOL is an open source IPMI software(http://ipmitool.sourceforge.net) . It supports Linux and Solaris. Users can use it to view most of IPMI jobs remotely. Detail please refer to ipmitool man page: http://ipmitool.sourceforge.net/manpage.html . IPMITool 1.8.2 have some issue and only partly work on M3291/3295. Please use the latest code from CVS server.
Following are some examples.

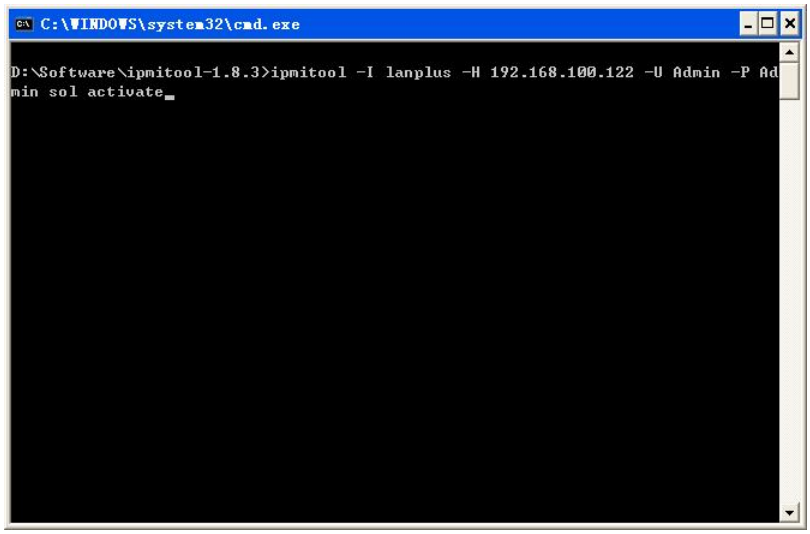
SEL

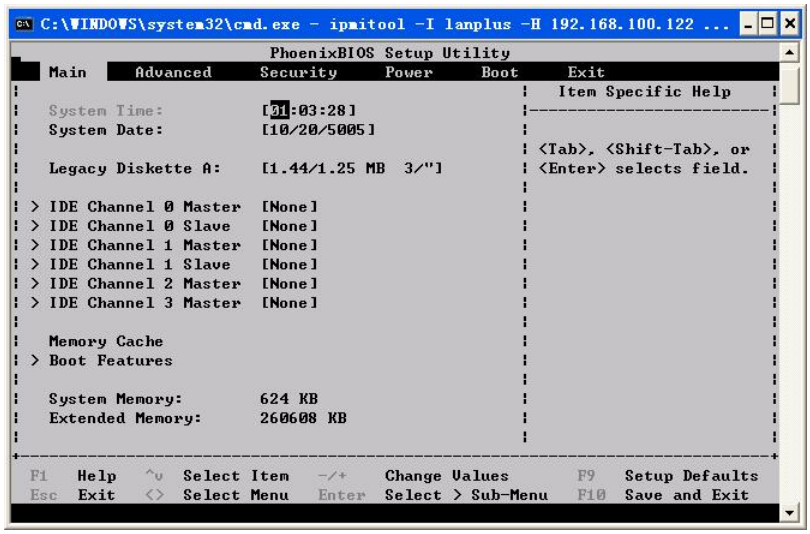

C:\WINDOWS\system32\cmd.exe
D:\Software\ipmitool-1.8.3>ipmitool -I lanplus -H 192.168.100.122 -U Admin -P Admin sel list
1 | 07/08/2005 | 18:22:29 | Temperature #0x35 | Upper Critical going high
2 | 07/08/2005 | 18:22:30 | Temperature #0x25 | Upper Critical going high
3 | 07/08/2005 | 18:22:30 | Temperature #0x27 | Upper Critical going high
4 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
5 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
6 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
7 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
8 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
9 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
a | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
b | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
c | 07/09/2005 | 12:32:36 | Temperature #0x35 | Upper Critical going high
d | 07/09/2005 | 12:32:39 | Temperature #0x35 | Upper Critical going high
e | 07/09/2005 | 12:33:10 | Temperature #0x35 | Upper Critical going high
f | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
10 | 07/09/2005 | 12:57:55 | Fan #0x3a | Lower Critical going low
11 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
12 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high
13 | Pre-Init Time-stamp | Fan #0x3b | Lower Critical going low
14 | Pre-Init Time-stamp | Fan #0x39 | Lower Critical going low
15 | Pre-Init Time-stamp | Fan #0x3a | Lower Critical going low
16 | Pre-Init Time-stamp | Temperature #0x35 | Upper Critical going high

Power Control


C:\WINDOWS\system32\cmd.exe
D:\Software\ipmitool-1.8.3>ipmitool -I lanplus -H 192.168.100.122 -U Admin -P Admin chassis power off
Chassis Power Control: Down/Off
D:\Software\ipmitool-1.8.3>ipmitool -I lanplus -H 192.168.100.122 -U Admin -P Admin chassis status
System Power : off
Power Overload : false
Power Interlock : inactive
Main Power Fault : false
Power Control Fault : false
Power Restore Policy : always-off
Last Power Event :
Chassis Intrusion : inactive
Front-Panel Lockout : inactive
Drive Fault : false
Cooling/Fan Fault : true
Self Test Results : passed
D:\Software\ipmitool-1.8.3>

Serial Over LAN (SOL)




C:\WINDOWS\system32\cmd.exe - ipmitool -I lanplus -H 192.168.100.122 ...
PhoenixBIOS Setup Utility
Main Advanced Security Power Boot Exit
Item Specific Help
System Time: [01:03:28]
System Date: [10/20/5005]
<Tab>, <Shift-Tab>, or <Enter> selects field.
Legacy Diskette A: [1.44/1.25 MB 3/"]
> IDE Channel 0 Master [None]
> IDE Channel 0 Slave [None]
> IDE Channel 1 Master [None]
> IDE Channel 1 Slave [None]
> IDE Channel 2 Master [None]
> IDE Channel 3 Master [None]
Memory Cache
> Boot Features
System Memory: 624 KB
Extended Memory: 260608 KB
F1 Help ^v Select Item -/+ Change Values F9 Setup Defaults
Esc Exit <> Select Menu Enter Select > Sub-Menu F10 Save and Exit

Chapter 5: Software Information

Tyan System Operator (TSO) is an IPMI-aware management tool for systems based on TYAN motherboards. Through TSO, Users have an easier way to remotely access system health information, do system maintenance and make the running systems much safer.

5.1 What is TSO

Three Components

The specially designed software TSO (Tyan System Operator) includes three components:

- TSO MANAGER
- TSO AGENT(optional)
- TSO CONSOLE

TSO supports the following operating system:
Windows 2000, Windows XP Pro (32/64-bit) and Windows Server 2003 (32/64-bit)
RedHat 7.2, 7.3, 8.0 and 9.0, Server 2.1, 3.0 and 4.0 (32/64-bit)
SuSE Server 8.0, 9.0, Professional 9.0, 9.1, 9.2 and 9.3 (32/64-bit)

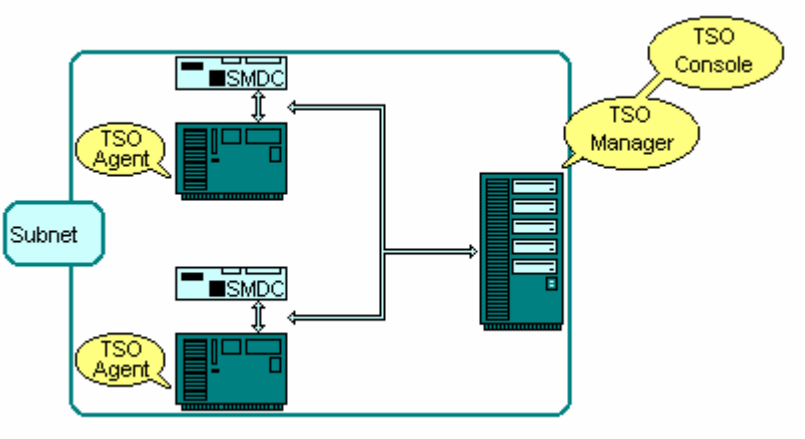
MANAGER
MANAGER is the core component of TSO. It provides communication between CONSOLE and AGENT. MANAGER is normally installed at the gateway or proxy machine in the subnet

AGENT(optional)
AGENT runs on a target system which is to be managed. AGENT is normally installed at a data-server or email-server machines. As IPMI improvement, most of IPMI function can be done under out-of-band, users don't need install AGENT normally.

CONSOLE
CONSOLE provides GUI (Graphic User Interface) for an administrator to perform all management functions.

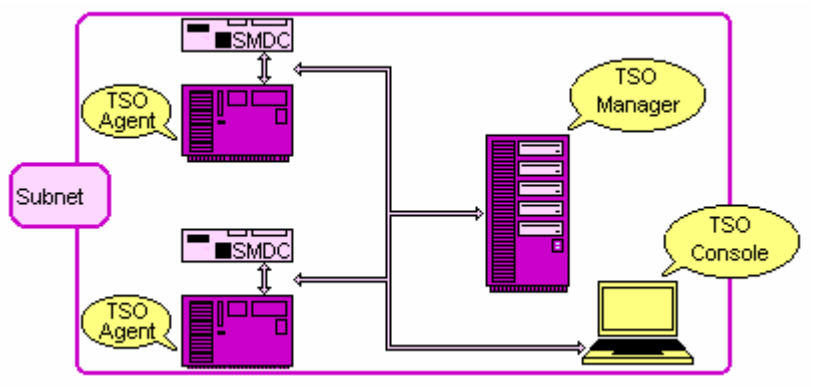
5.2 TSO Connection Models

5.2.1 Simple Intranet Model-1



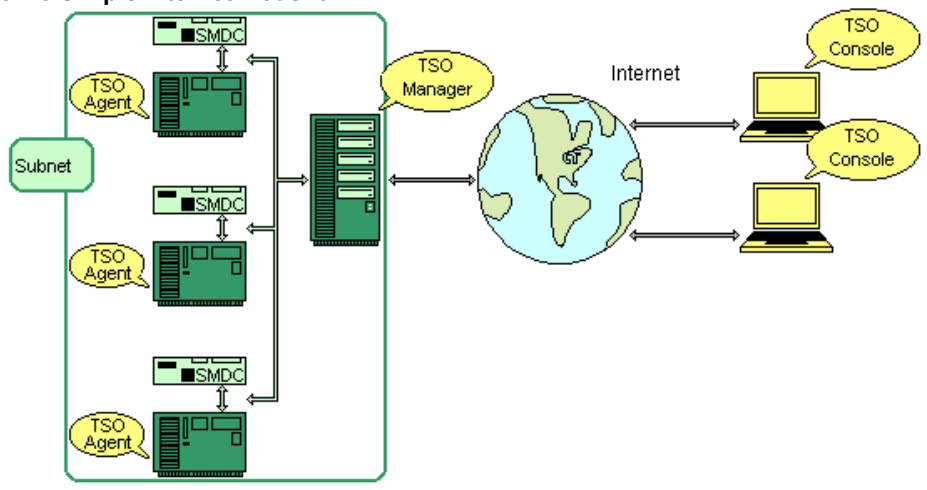
- TSO MANAGER and CONSOLE can be loaded onto the same system
- TSO AGENT can only work over Tyan server motherboards
  (Check www.tyan.com TSO FAQ)

5.2.2 Simple Intranet Model-2



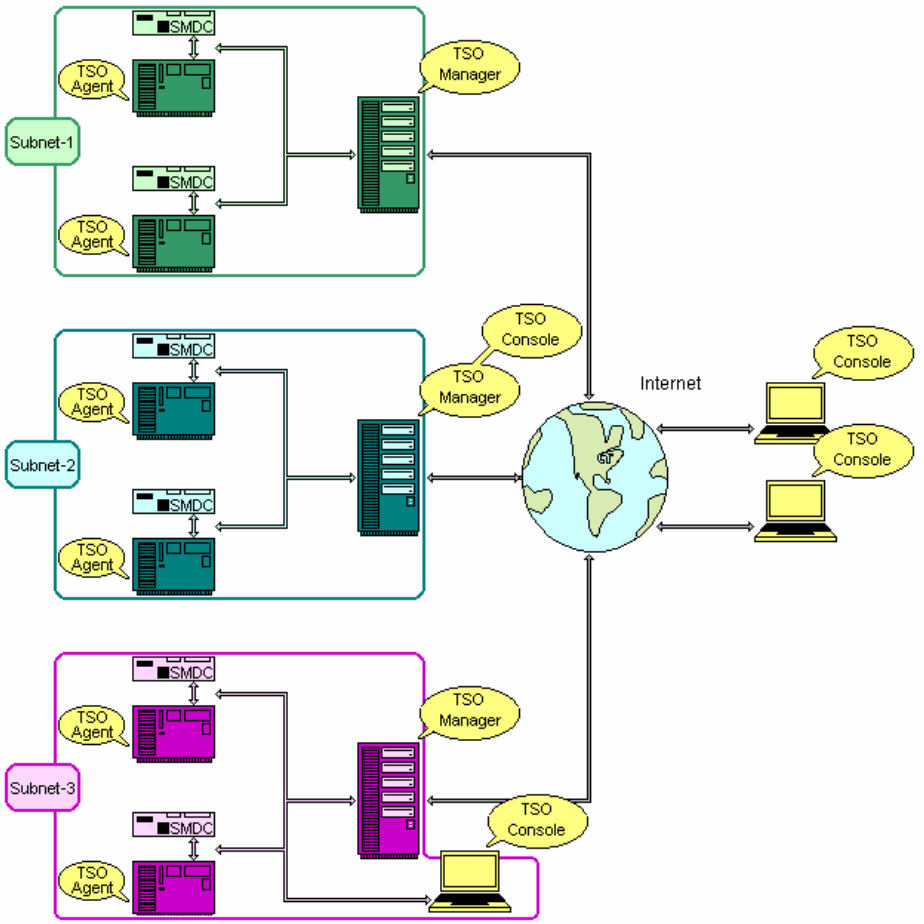
- TSO MANAGER and CONSOLE can be loaded onto two separate systems
- TSO AGENT can only work over Tyan server motherboards
  (Check www.tyan.com TSO FAQ)

5.2.3 Simple Internet Model-3



- TSO MANAGER and CONSOLE can be loaded onto two separate systems
- TSO AGENT can only work over Tyan server motherboards

5.2.4 Complex Internet Model



- TSO MANAGER and CONSOLE can be loaded onto separate systems
- TSO AGENT can only work over Tyan server motherboards
  (Check www.tyan.com TSO FAQ)
- All TSO CONSOLE systems can log in different MANAGER to read/control AGENT systems

5.3 TSO Access Model

- In-Band
  - MANAGER talks to AGENT system through the OS and AGENT services
  - In-band can only function when the OS and AGENT services are running
- Out-Of-Band
  - MANAGER talks to AGENT system through the BMC chip of the SMDC
  - Out-of-band can function with or without the OS and Agent services.
- Access Authentication
  - MANAGER/AGENT/SMDC Authentication
- In-Band Access

  CONSOLE needs to

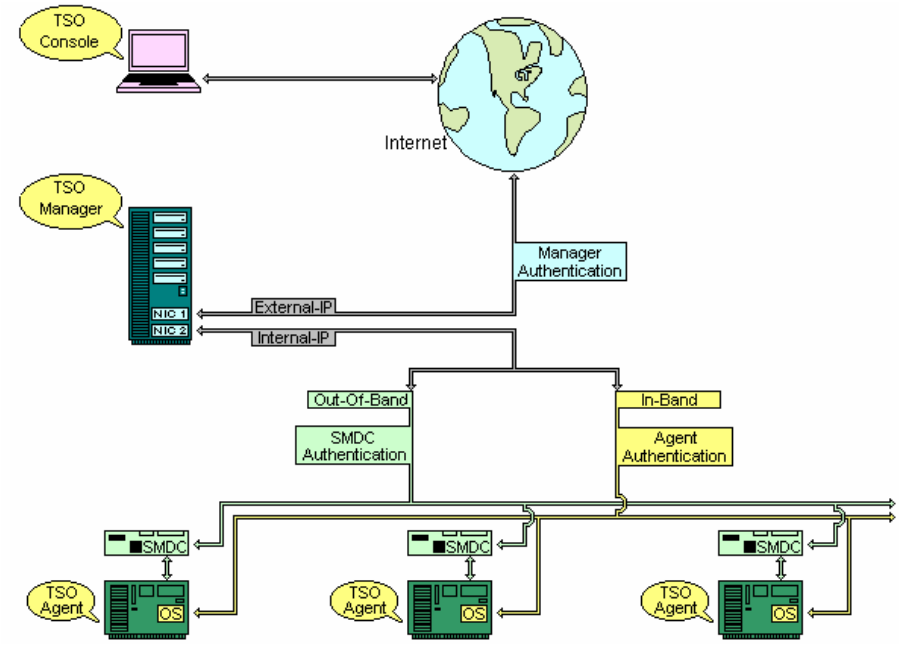
  (1) pass the MANAGER Authentication and

  (2) pass the AGENT Authentication to access all In-Band features
- Out-Of-Band Access

  CONSOLE needs to

  (1) pass the MANAGER Authentication and

  (2) pass the SMDC Authentication to access all Out-Of-Band features
- External-IP and Internal-IP



5.4 Features

Remote System Health Monitoring & Alerting
Remote monitor system's health, including voltage, temperature, fan and so on. Log event when error occurs and alert by beeping, emailing administrator, or doing power down/reboot, according to customizable settings.

- IPMI related information browsing
  Browse FRU, SDR, Sensor Reading and SEL. Both raw data and interpreted data are displayable, and selectable by user

- System status reporting
  Report system health information in fixed period. Report system power state (On/Off). Report system information source (BMC or Hardware Monitor).

- Remote IPMI command execution
  Remote execute IPMI command according to IPMI specification.

Remote System Maintenance

- Remote update BMC firmware if BMC is available.(optional)

- Modify SDR information to affect system monitoring and alerting
  User can modify the event trigged thresholds per sensor and set alert actions per sensor. So as to customize the system's IPMI settings.

- Watchdog
  User can enable the watchdog to doing reboot when OS is dead.

- Gracefully system power control
  Remote power down / reboot the system gracefully. Wake the system on LAN.

Hard system power control through IPMI-over-LAN
Remote power up/power down/reboot the system through IPMI-over-LAN. BMC must be available.

- Server Grouping
  Servers under monitoring can be grouped according to user's demands.

- Server viewing based on group
  Servers are organized in different groups. User can do the grouping according to the demands.

Security
Actions taken on the server are authenticated based on the user privilege.

- User account management
  Add, modify and delete user. Assign privilege to user on the specific server.

5.5 Pre-setup and Installation

5.5.1 Pre-setup

Authentication and Privilege
TSO provides security access with MANAGER Authentication, Agent Authentication and SMDC Authentication. User needs to prepare the privilege information (user-name and password) for each system in order to access target system.

- No password is prohibited
- Case sensitive under Linux and Out-of-Band

Internal-IP and External-IP
TSO requires Internal-IP and External-IP setup by user during the TSO installation. User needs to make sure the IP matching with Network Interface Controllers (NIC).

- Configuration I
  If CONSOLE is often being used outside of the subnet in which all/some machines are equipped with SMDC, the machine that runs MANAGER would have 2 NIC's. MANAGER will likely be installed at the gateway or proxy machine in the subnet.
  - Configure **Internal IP** to be a valid IP under this subnet. This subnet is typically known as a Local Area Network (LAN). The IP would look like this for example: 192.168.1.1, 192.168.1.254
  - Configure **External IP** to be a valid IP under the main network. This main network is typically known as a Wide Area Network (WAN). This IP would be a 'true' IP, meaning it is the one and only one among all the machines in the world. The IP would look like this for example: 206.13.28.12, 216.239.53.99
- Configuration II
  If CONSOLE is being used inside the same subnet, the machine that runs Manager may have only 1 NIC. MANAGER can be located on any machine in the network. Notice that MANAGER and CONSOLE need not be installed on the same machine even though they can/may be install on the same machine.
  - Configure **Internal IP** to be a valid IP under this subnet.
  - Configure **External IP** to be the same as Internal IP.

- **Firewall**
  Firewall setup information:
  TSO MANAGER and CONSOLE will use the following 4 ports for firewall setup.
  - TCP:
    20010
    21020

21021
21030
21031

- UDP

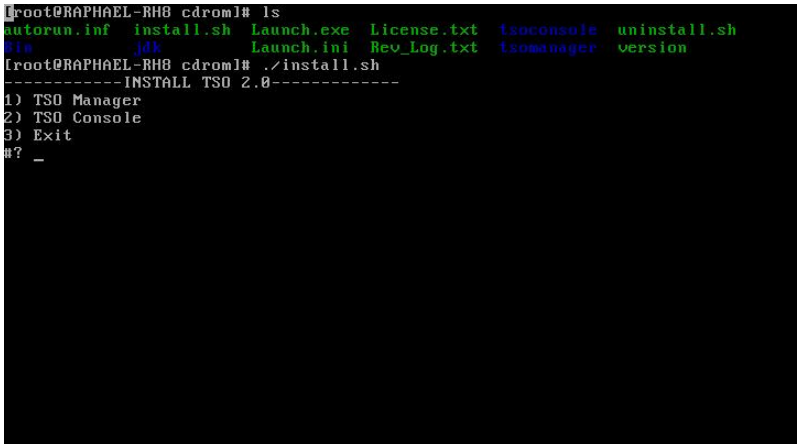
624
7777
20040
20060

For RedHat Firewall (IPTABLES) Setup
1. Type "setup" to execute the setup utility
2. Select "Firewall Configuration"
3. Select "Customize"
4. Select "Other Ports"
5. Type "20010:tcp, 20040:upd, 20060:udp, 21020:tcp"
6. Select "OK

5.5.2 Installation

- **Installation Procedures under Linux System (via KDE or Gnome GUI Interface)**

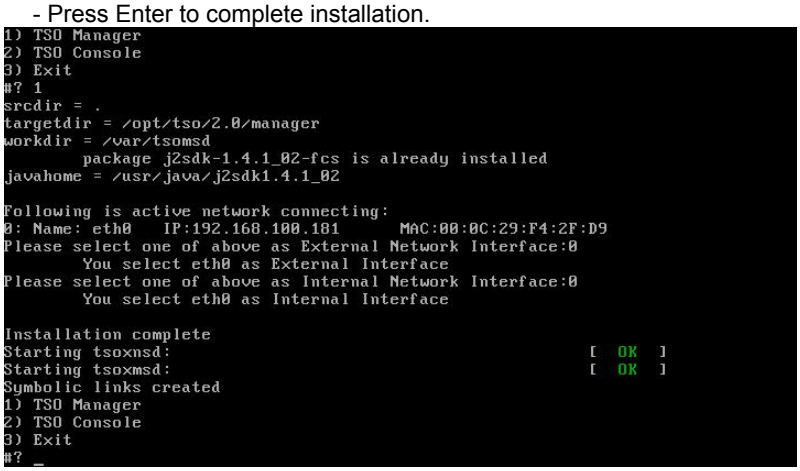
  Put the TSO CD into the CD-ROM drive. You will see a TSO CD-ROM icon on the screen.
  1. Click on TSO CD-ROM
  2. Click on the menu “install.sh”
  3. You will see the screen of “Run or Display”. Choose and click “Run in Terminal”. You will see the screen with four choices: TSO Agent/TSO Manager/TSO Console/Exit. Type the number you want to install.



Agent:
- Select one of network interfaces to bundle (0 or 1).
- Press Enter to complete installation.

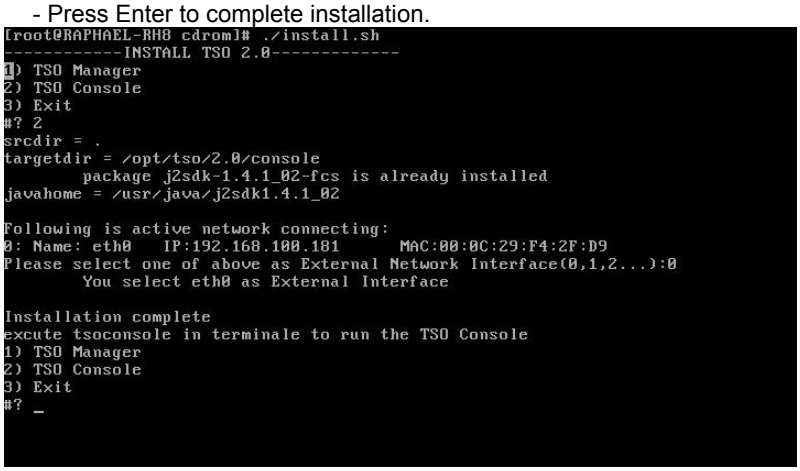
Manager:

- Select one of external network interface to bundle.
- Press Enter to complete installation.


1) TSO Manager
2) TSO Console
3) Exit
#? 1
srcdir = .
targetdir = /opt/tso/2.0/manager
workdir = /var/tsomsd
package j2sdk-1.4.1_02-fcs is already installed
javahome = /usr/java/j2sdk1.4.1_02
Following is active network connecting:
0: Name: eth0 IP:192.168.100.181 MAC:00:0C:29:F4:2F:D9
Please select one of above as External Network Interface:0
You select eth0 as External Interface
Please select one of above as Internal Network Interface:0
You select eth0 as Internal Interface
Installation complete
Starting tsoxnsd: [OK]
Starting tsoxmsd: [OK]
Symbolic links created
1) TSO Manager
2) TSO Console
3) Exit
#? _

Console:

- Select one of external network interfaces to bundle.
- Press Enter to complete installation.



4. After finishing the installation, select Exit to leave the screen.

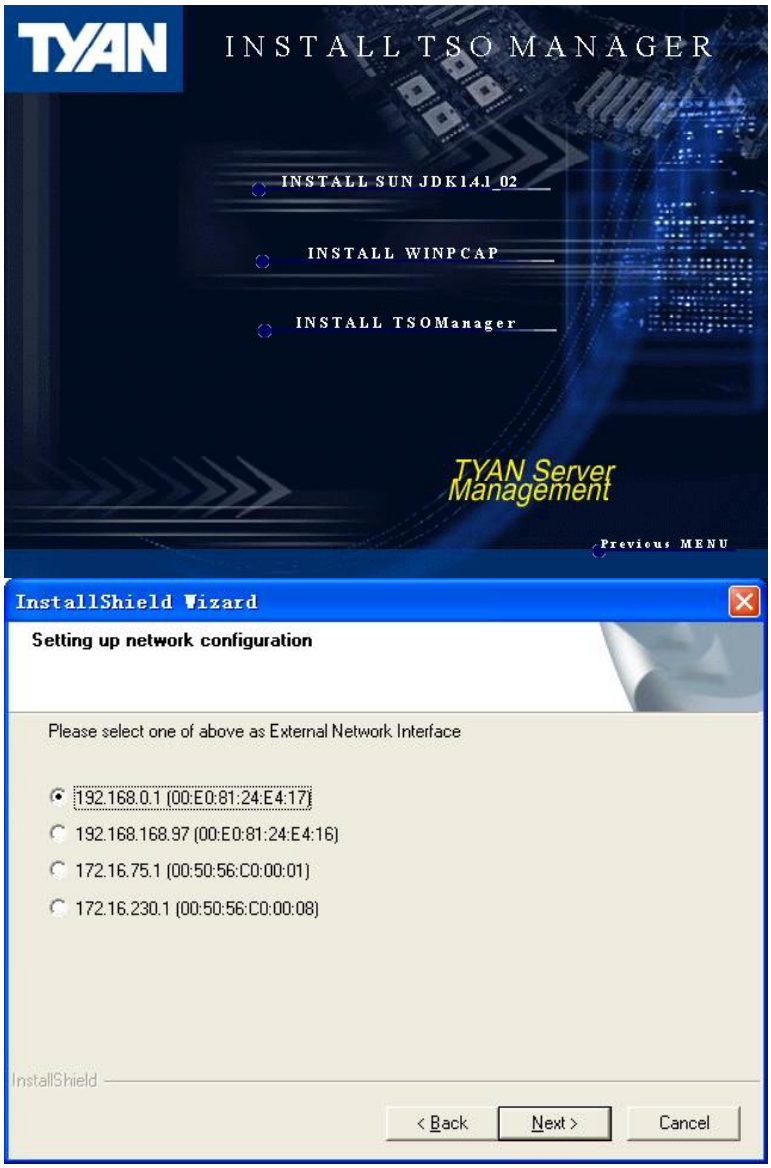
- **Installation Procedures under Windows System**

Agent

1. Put the TSO CD in the CD-ROM drive.
2. Click on the “TSO” item. Select “TSO Server Agent”.
3. Click on “Next” to start the installation procedure.
4. Indicate the Server Agent’s computer name.
5. A License Agreement menu will pop up. Click “Yes”.
6. Click on “Next” after confirming the use of destination directory.
7. Click on “Next” to confirm the setting.
8. Click on “Finish” to finish the installation.

Manager

1. Insert TSO CD into CD-ROM drive. Select “TSO”.
2. Double click “TSO Manager”.
3. Double click “INSTALL SUN JDK1.4J_02”.
4. You will see a Welcome menu. Click “Next”.
5. A License Agreement menu will pop up. Click “Yes”.
6. After confirming the destination location of software, click “Next”.
7. Select all the components and then click “Next”.
8. The software will link with IE. Click “Next”.
9. Click “Finish” to finish “Javk2 SDK installation.
10. Go back to TSO manager installation menu. Select “INSTALL WINPCAP”.
11. Installation Wizard will show up. Click “Next”.
12. Click “Next” if you agree with License Agreement.
13. Click “OK” to finish WinPcap 3.0 installation.
14. Go back to TSO manager installation menu. Select “INSTALL TSOManager”.
15. A welcome message will pop up. Click “Next”.
16. Click “Yes” if you agree with the TSO License Agreement.
17. After filling in user and company names, click “Next”.
18. Click “Next” after confirming the destination location of software.
19. Click “Yes” to reboot the system to initiate TSO Manager.
20. Click “Finish” to finish the TSO manager installation.



Console

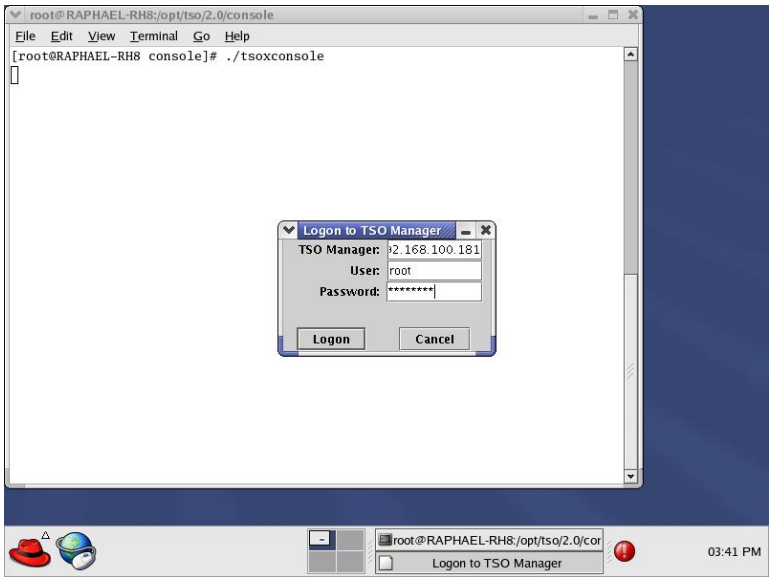
1. Put “TSO” CD into CD-ROM drive. Click “TSO Console”.
2. Click on “INSTALL SUN JDK 1.4J_02”.
3. A Welcome message will appear. Click “Next”.
4. A License Agreement menu will show up. Click “Yes”.
5. After confirming the destination location of software, click “Next”.
6. Select all the components and then click “Next”.

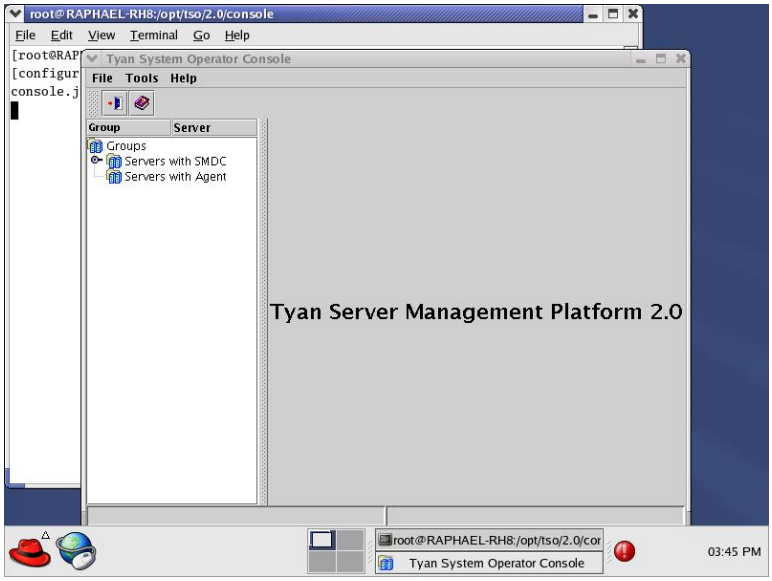
7. The software will link with IE. Then click “Next”.
8. Click “Finish” to finish Javk2 SDK installation.
9. Go back to “INSTALL TSO CONSOLE” menu. Select “INSTALL TSO Console”.
10. A Welcome Message will pop up. Click “Next”.
11. A License Agreement menu will show up. Click “Yes”.
12. After typing user and company names, click “Next”.
13. After confirming the destination location of software, click “Next”.
14. Choose the match LAN port IP and MAC for SMDC cards. Then click “Next”.
15. Click “Finish” to finish TSO Console installation.

5.5.3 Run TSO

- In Linux, go to /opt/tso/1.6/console, and run ./tsoxconsole
- In Windows, open start->programs->TSO

In TSO login window, the first field is your management system IP, and the second field is OS user ID and password same as you login the OS that runs console .


root@RAPHAEL-RH8:/opt/tso/2.0/console
File Edit View Terminal Go Help
[root@RAPHAEL-RH8 console]# ./tsoxconsole
Logon to TSO Manager
TSO Manager:
User: root
Password:
Logon
Cancel
root@RAPHAEL-RH8:/opt/tso/2.0/cor
Logon to TSO Manager
03:41 PM

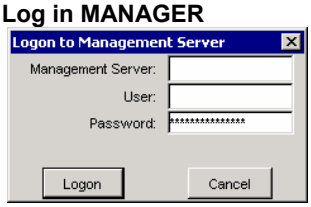

root@RAPHAEL-RH8:/opt/tso/2.0/console
File Edit View Terminal Go Help
Tyan System Operator Console
File Tools Help
Group
Server
Groups
Servers with SMDC
Servers with Agent
Tyan Server Management Platform 2.0
root@RAPHAEL-RH8:/opt/tso/2.0/cor
Tyan System Operator Console
03:45 PM

5.6 TSO Access

TSO provides two ways (In-Band and Out-Of-Band) for reading and controlling AGENT systems.

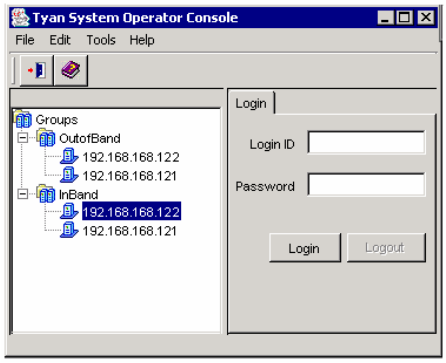
5.6.1 In-Band Access

- **Log in MANAGER**



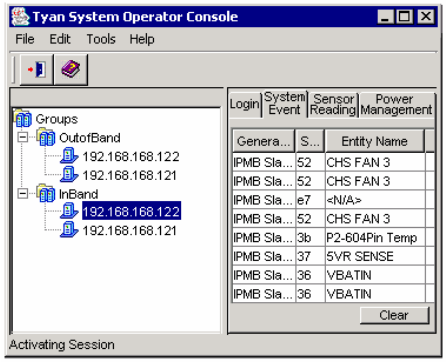
  - Log in MANAGER from CONSOLE with the privilege ID, user name and password

- **Log in AGENT**



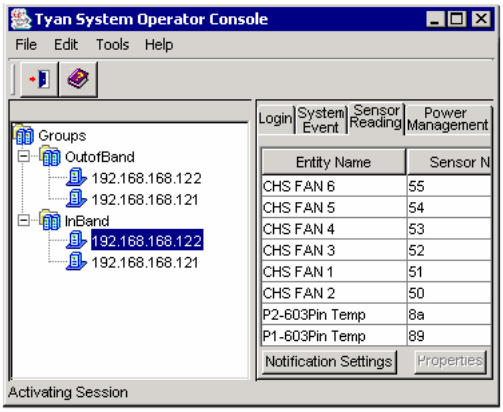
  - Highlight the IP of the target system (Under In-Band)
  - Log in AGENT of the target system with the privilege ID and password

- **System Event Panel**



  - Click “System Event Panel” to read all event log of the target system
  - “Clear” Icon
    Click the icon to clear system event log

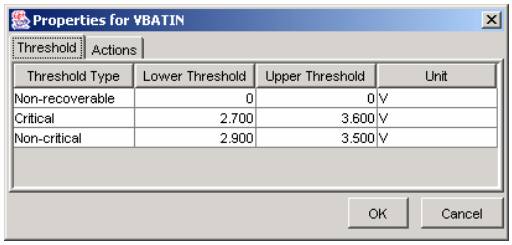
- **Sensor Reading Panel**



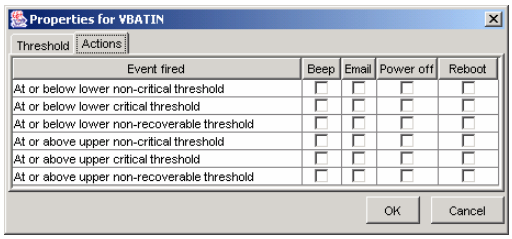
- Click “Sensor Reading Panel” to read all sensor data record of the target system

- “Notification Setting” Icon
  - Highlight any row in the SDR window
  - Click the icon to set Sensor Threshold

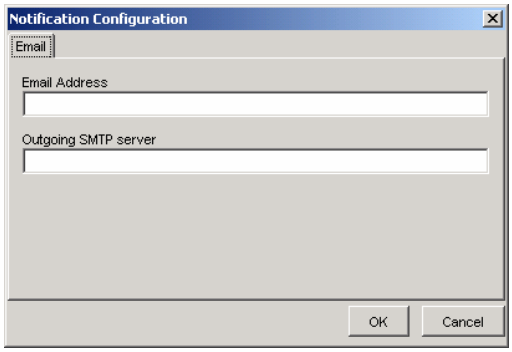
- “Properties” Icon
  - Highlight any row in the SDR window
  - Click the icon to set Sensor Alert Action



- Sensor Threshold
  - Make changes to lower and upper thresholds

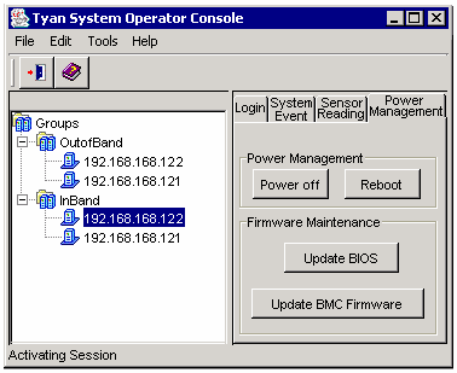


- Sensor Alert Action
  - Check the desired alert method



- Notification Configuration
  - Input a valid e-mail address
  - Input a valid SMTP server
  - Email information will be used if email event action is desired

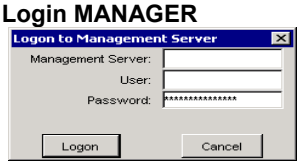
- **Power Management Panel**



- Click “Power Management Panel” to access all In-Band power management features of the target system
- “Power Off” Icon
  - Click the icon to have the target system do graceful shutdown
- “Reboot” Icon
  - Click the icon to have the target system do graceful reboot
- “Update BIOS” Icon
  - Click the icon to flash the system BIOS of the target system
- “Update BMC Firmware” Icon
  - Click the icon to flash the SMDC BMC firmware of the target system

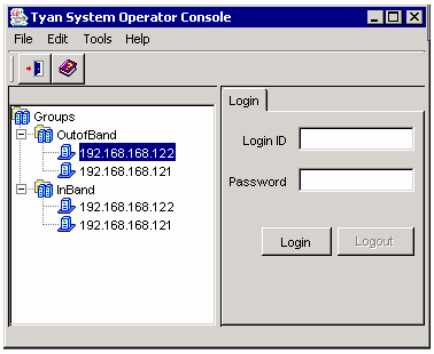
5.6.2 Out-Of-Band Access

- **Login MANAGER**



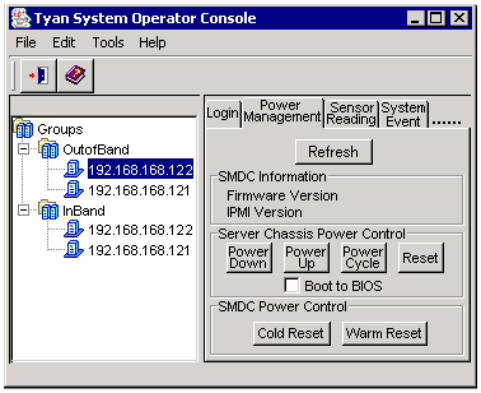
- Log in MANGER from CONSOLE with the privilege ID, user name and password.

- **Login SMDC MANAGER**



- Highlight the IP of the target system (Under Out-Of-Band)
- Log in SMDC with the privilege ID and password
- Privilege Names: Administrator, User, Callback, and Operator **(case sensitive)**

- **Power Management Panel**



- Click “Power Management Panel” to access all Out-of-Band power management features of the target system

- “Refresh” Icon
  - Click the icon to instantly update SMDC Information

“Power Down” Icon
  - Click the icon to hard shutdown the target system

- “Power UP” Icon
  - Click the icon to power up the target system

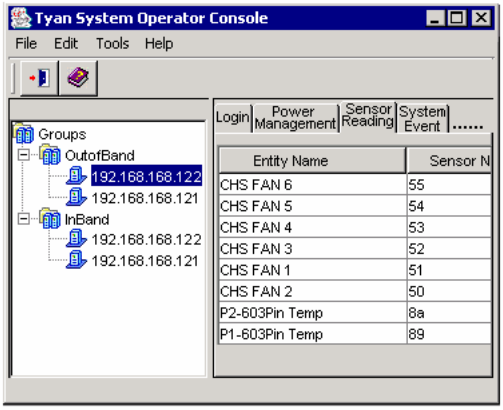
“Power UP” Icon with “Boot to BIOS” checked
  - Click the “Power UP” icon with “Boot to BIOS” checked to get into the target system BIOS setup when system is powered up

- “Power Cycle” Icon
  - Click the icon to power cycle the target system

(Target system would power down for a few seconds then power up)

- “Reset” Icon
  - Click the icon to reset the target system
  -
- “Reset” Icon + “Boot to BIOS” checked
  - Click the icon with “Boot to BIOS” checked to get into target system BIOS after system is reset
  -
- “Cold Reset” Icon
  - Click the icon to cold reset SMDC
  -
- “Warm Reset” Icon
  - Click the icon to warm reset SMDC

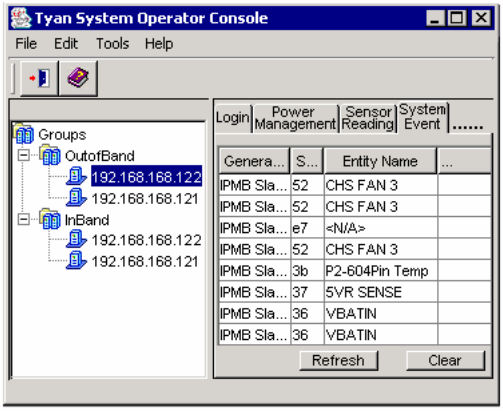
- **Sensor Reading Panel**



- Click “Sensor Reading Panel” to read all sensor data record of the target system

  - The initial access of the sensor reading panel will take about one minute and all readings will be updated there after every 15 seconds.

- **System Event Panel**



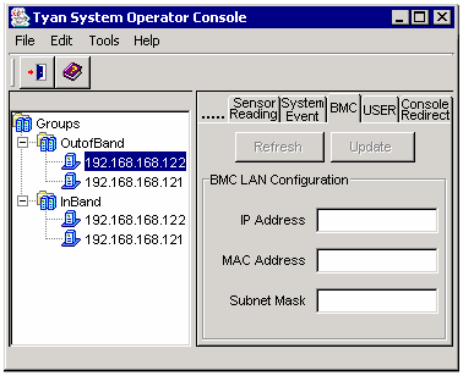
- Click “System Event Panel” to read all event log of the target system

  - The initial access of the system event panel will take about one minute and all system events will be updated there after every 15 seconds.

- “Refresh” Icon
  Click the icon to refresh system event log

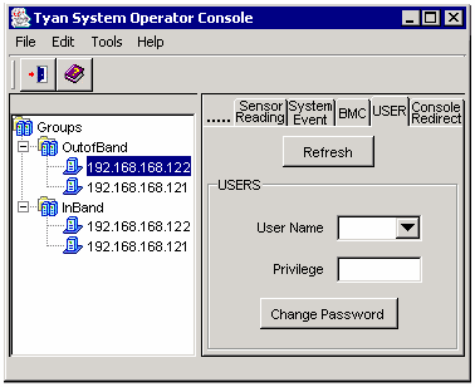
- “Clear” Icon
  Click the icon to clear system event log

- **BMC Panel**



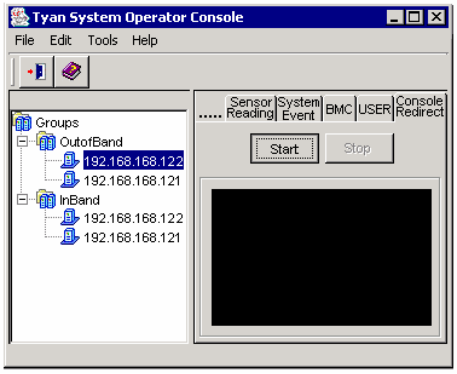
- Click “BMC Panel” to read all BMC LAN configurations of the target system
- “Refresh” Icon
  - Click the icon to review IP Address, MAC Address and Subnet Mask
- “Update” Icon
  - Make all desired changes about IP Address, MAC Address and Subnet Mask
  - Click the icon to update new values into SMDC

- **User Panel**



- Click “User Panel” to access SMDC privilege of the target system
- “Refresh” Icon
  - Click the icon to review available users
- “User Name” Bar/Drag Down
  - Click the button and scroll to the desired user
- “Privilege” Field
  - Review privilege for corresponding user
- “Change Password” Icon
  - Click the icon to update password

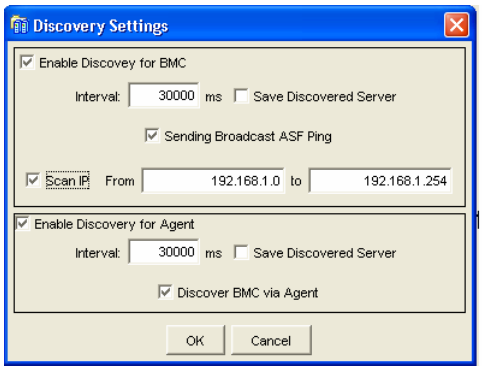
- **Console Redirect Panel**



- Click “Console Redirect Panel” to begin console redirect via LAN feature of the target system
- “Start” Icon
  - Click the icon to start console redirect via LAN feature of the target system
- “Stop” Icon
  - Click the Stop icon to stop the console redirect via LAN feature of the target system.

5.6.3 Discovery Setting

- **Discovery setting dialog**



- Enable or Disable discover BMC or TSO Agent
- Set the interval between the two to discover action
- Enable or Disable save the discovered system record on TSO Manager
- When an OS is running on a server with BMC, the Broadcast ASF Ping will be ignored by the OS TCP/IP stack. You will need to enable the “Scan IP” function to discover the BMC.
- If you install the TSO Agent on the server with BMC, you also can “Discover the BMC via Agent” while the OS is running.

Chapter 6: Troubleshooting

The following provides the general problems and solutions you will meet in setting up the SMDC card. For more information, please visit our website **http://www.tyan.com.**

Question: What are SMDC and TSO?
Solution: SMDC means System Management Daughter Card. It's an embedded system, independent of the operating system, using the SMBus to monitor hardware sensors. TSO means Tyan System Operator. It is installed on different operating systems and allows remote or local monitoring.

Where can I find information about SMDC/TSO on the Tyan Website?
You can find a page of information for all related motherboards and SMDC/TSO needs at the following link: **http://www.tyan.com/support/html/faq_tso.html**

Where can I find information about bios versions that are needed for my motherboard so it supports SMDC/TSO correctly?
Tyan released BIOS(depend on board spec that support SMDC) are available for SMDC.
http://www.tyan.com/support/html/bios_support.html

Where can I find information about firmware versions that are needed for my motherboard so it supports SMDC/TSO correctly?
You can find a listing of all the firmware versions at the following link:
http://www.tyan.com/support/html/software_utilities.html

Where can I find information about utilities that are needed for my motherboard so it supports SMDC/TSO correctly?
You can find the utilities at the following link:
ftp://ftp.tyan.com/software/tso/m3291/utility/

Where can I find information about utilities that are needed for my motherboard so it supports TSO correctly?
You can find the TSO software at the following link:
ftp://ftp.tyan.com/software/tso/m3291/tso/

Where can I find the link to the manual?
You can find the manual at the following link:
ftp://ftp.tyan.com/software/tso/m3291/manuals

Question: Does your SMDC support OpenIPMI?
Solution: Yes. Please enable Gratitous ARP when using OpenIPMI and other IPMI compliant software.

Question: Do you provide a 64-bit version of the TSO Agent?
Solution: Yes

Question: Why can I not discover the SMDC card?
Solution: There may be many reasons why the SMDC card is not located:

- Check the SMDC light. Make sure that when the computer is on it is in "power on" status (light continually on and not flashing). This assures that the SMDC firmware is functioning properly. When the computer is off the light should be flashing. If it is not flashing, you may need to reset the comes (2 pins next to the battery).
- Use Util.exe in DOS mode to check IP and MAC address. Make sure they are set correctly on the SMDC card.
- Check the setting of "discovery" in Console tool menu. Assure that the IP addresses are within the range indicated. Also make sure this function is enabled.
- Use Util.exe in DOS mode to assure that the firmware version and board model are correct. If you do not have the correct firmware you may need to download it from the TYAN SMDC ftp site.
- Make sure the correct SMDC firmware for the Broadcom Lan chip is flashed. Also assure you are using the correct NIC port which is supported for this board.

Read "Readme" first and also use Util.exe to enable ARP broadcast.

Question: Does SMDC support the ARP protocol?
Solution: Yes, SMDC supports the Gratuitous ARP and broadcasts the ARP package periodically.

Question: What are the password and user name for protected SMDC firmware?
Solution:
For out of Band –As specified by IPMI there are 4 security accounts: "Operator, Admin, Callback, User and Null (blank)". Use Util.exe to set this password. You can change this password using the remote console function 'Change Password'. The username and password are case-sensitive.
For in band –Log into the monitored system using a valid username and password as required by the respective operating system.

Question: What's the M3291 Driver
Solution:
As IPMI is OS-independent, normally users don't need load any driver when using M3291. But some times, when users want to use some in-band utility or application, IPMI driver is needed.

Windows:
M3291 can use the Intel IPMI Reference Driver. Users can get it at:
http://www.intel.com/design/servers/ipmi/tools.htm

Install driver automatically
execute "win2kinstall path\imbdrv.inf *imbdrv"
sometimes, it will fail. It's not M3291 issue. It's driver installation issue. you have to install driver manually.

Install driver manually

Control Panel->Add Hardware
Select “No, I have already connected the hardware”
Select “add a new hardware device”
Select “Install the hardware the I manually select from a list”
Select “System Devices”
Select “Have Disk”
Select “Browse”
Select file “imbdrv.inf”

Linux:

M3291 can use the OpenIPMI driver in Linux Kernel. But as M3291 KCS port is CA8:CAC, version V33 is needed.

```
modprobe ipmi_devintf
modprobe ipmi_si
```

If “ipmi_si” module load fail, you can try to add parameter:

```
modprobe ipmi_si type=kcs ports=0xca8 irqs=0 regspacings=4
```

Question: How can I use SMDC function before OS is installed and running?
Solution: Follow the steps below:
1. Connect the AC power.
2. Boot the system into BIOS and shutdown the BIOS – this step only need to be done once after one SMDC is installed in the mainboard, and SMDC needs the information of MAC address from mainboard.
3. Install the TSO manager and TSO console correctly in client machine.
4. Start TSO console and use Tool/Discovery setting to make sure the SMDC discovery is enabled (including broadcast discovery).
5. All systems with SMDC installed will show up. Correctly set the IP address.
6. Now you can use the Power/Off and other SMDC functions

Question: How to set console redirection SOL in BIOS?
Console redirection Serial Over Lan need BIOS support
1. BIOS Advance setting,
a. COM port B
b. Baud rate 19200
c. VT100
d. RTS/CTS
e. After POST ,always on

Question: How to set linux Text mode SOL display?

```
Please refer to /user/src/Linux-2.4/Documentation/serial-
console.txt for detail.

1.boot kernel message showing:
/etc/lilo.conf

#put this line under message=/boot/message
```

```
serial=1,19200n8

#Change  append="root=LABEL=/" to
        append="root=LABEL=/ console=ttyS1,19200n8
console=tty0"


After changing and saving the lilo.conf, you need to use
"lilo" to update the boot conf.

Please find the conf for grub if you want to use that.

2. For the terminal login
/etc/inittab

#After 6:2345:respawn:/sbin/mingetty tty6 add next line
S1:23:respawn:/sbin/agetty -L 19200 ttyS1 vt100

3. If you want to logon to Linux as "root"
In /etc/securetty, add one line

ttyS1

#END
```

Question: What Linux OS does TSO support?

RedHat 7.2, 7.3, 8.0 and 9.0, Server 2.1, 3.0 and 4.0(32/64-bit)
SuSE Server 8.0, 9.0, Professional 9.0, 9.1, 9.2 and 9.3(32/64-bit)

Question: Why and how to flash Broadcom firmware?
1. Default Broadcom Nic doesn't support IPMI function. Support IPMI function you need flash Broadcom firmware to Nic Nvram. For dual port chip, current only one port supports IPMI, default is port 0 that is MAC small one.

2. Broadcom firmware download link:
ftp://smdcGuest:53dcgop@66.122.195.2/smdc/M3291/firmware/Broadcom

3. See readme. So far Broadcom only supports Dos utility to flash.

Technical Support

If a problem arises with your system, you should first turn to your dealer for direct support. Your system has most likely been configured or designed by them and they should have the best idea of what hardware and software your system contains. Hence, they should be of the most assistance for you. Furthermore, if you purchased your system from a dealer near you, take the system to them directly to have it serviced instead of attempting to do so yourself (which can have expensive consequences).

If these options are not available for you then Tyan Computer Corporation can help. Besides designing innovative and quality products for over a decade, Tyan has continuously offered customers service beyond their expectations. Tyan's website (**www.tyan.com**) provides easy-to-access resources such as in-depth Linux Online Support sections with downloadable Linux drivers and comprehensive compatibility reports for chassis, memory and much more. With all these convenient resources just a few keystrokes away, users can easily find the latest software and operating system components to keep their systems running as powerful and productive as possible. Tyan also ranks high for its commitment to fast and friendly customer support through email. By offering plenty of options for users, Tyan serves multiple market segments with the industry's most competitive services to support them.

"Tyan's tech support is some of the most impressive we've seen, with great response time and exceptional organization in general" - Anandtech.com

Please feel free to contact us directly for this service at **techsupport@tyan.com**

Help Resources:

1. **See the beep codes section of this manual.**
2. **See the TYAN website for FAQ's, bulletins, driver updates, and other information: http://www.tyan.com**
3. **Contact your dealer for help BEFORE calling TYAN.**
4. **Check the TYAN user group: alt.comp.periphs.mainboard.TYAN**

Returning Merchandise for Service

During the warranty period, contact your distributor or system vendor FIRST for any product problems. This warranty only covers normal customer use and does not cover damages incurred during shipping or failure due to the alteration, misuse, abuse, or improper maintenance of products.

NOTE: A receipt or copy of your invoice marked with the date of purchase is required before any warranty service can be rendered. You may obtain service by calling the manufacturer for a Return Merchandise Authorization (RMA) number. The RMA number should be prominently displayed on the outside of the shipping carton and the package should be mailed prepaid. TYAN will pay to have the board shipped back to you.

Notice for the USA
Compliance Information Statement (Declaration of Conformity Procedure) DoC
FCC Part 15: This device complies with part 15 of the FCC Rules

Operation is subject to the following conditions:

1) This device may not cause harmful interference
2) This device must accept any interference received including interference that may cause undesired operation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

    - Reorient or relocate the receiving antenna.
    - Increase the separation between the equipment and the receiver.
    - Plug the equipment into an outlet on a circuit different from that of the receiver.
    - Consult the dealer on an experienced radio/television technician for help.

Notice for Canada
This apparatus complies with the Class B limits for radio interference as specified in the Canadian Department of Communications Radio Interference Regulations. (Cet appareil est conforme aux norms de Classe B d'interference radio tel que specifie par le Ministere Canadien des Communications dans les reglements d'ineteference radio.)

Notice for Europe (CE Mark)
This product is in conformity with the Council Directive 89/336/EEC, 92/31/EEC (EMC).

CAUTION: Lithium battery included with this board. Do not puncture, mutilate, or dispose of battery in fire. Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by manufacturer. Dispose of used battery according to manufacturer instructions and in accordance with your local regulations.

Appendix A: M3295 OPMA Interface Pin definition table

Class	Pin	Dir	Signal	Signal	Dir	Pin	Class
	1		GND	RSVD		2	
	3		RSVD	GND		4	
	5		GND	RSVD		6	
	7		RSVD	GND		8	
	9		GND	DVI_TX0_H		10	
	11		LDRQ_L	DVI_TX0_L		12	
	13		LFRAME_L	GND		14	
	15		LAD0	DVI_TX1_H		16	
	17		LCLKRUN_L	DVI_TX1_L		18	
LPC	19		LAD1	GND		20	
	21		LAD2	DVI_TX2_H		22	
	23		LAD3	DVI_TX2_L		24	
	25		SERIRQ	GND		26	DVI-I
	27		LRST_L	DVI_TX_CLK_H		28	
	29		LCLK	DVI_TX_CLK_L		30	
	31		GND	GND		32	
	33		RSVD	DVI_DDC_DATA		34	
	35		RSVD	DVI_DDC_CLK		36	
	37		GND	RSVD		38	
	39		MCARD_I2C_PRIVATE0_SCL	ANALOG_DDC_DATA		40	
	41		MCARD_I2C_PRIVATE0_SDA	ANALOG_DDC_CLK		42	
	43		GND	GND		44	
	45		MCARD_I2C_IPMB_SCL	ANALOG_RED		46	
	47		MCARD_I2C_IPMB_SDA	ANALOG_GREEN		48	
	49		GND	ANALOG_BLUE		50	
I2C	51		MCARD_I2C_SIDEBAND_NIC_SCL	ANALOG_HSYNC		52	
	53		MCARD_I2C_SIDEBAND_NIC_SDA	ANALOG_VSYNC		54	
	55		MCARD_I2C_SIDEBAND_NIC_ALERT	GND		56	
	57		GND	RSVD		58	
	59		MCARD_I2C_PRIVATE1_SCL	RSVD		60	
	61		MCARD_I2C_PRIVATE1_SDA	GND		62	
	63		GND	MCARD_FAN_PWM_CPU		64	

	65		MCARD_I2C_SHARED_SCL	MCARD_FAN_PWM_SYS		66	PWM
	67		MCARD_I2C_SHARED_SDA	MCARD_FAN_PWM_PS		68	
	69		GND	GND		70	
	71		DEBUG_IF0	MCARD_FAN_TACH0		72	
DEBUG	73		DEBUG_IF1	MCARD_FAN_TACH1		74	TACH
	75		DEBUG_IF2	MCARD_FAN_TACH2		76	
	77		DEBUG_IF3	MCARD_FAN_TACH3		78	
	79		GND	GND		80	
	81		MCARD_DTR0_L	MCARD_FAN_SEL0_L		82	
	83		MCARD_DCD0_L	MCARD_FAN_SEL1_L		84	FAN
	85		MCARD_DSR0_L	MCARD_FAN_SEL2_L		86	SELECT
SERIAL	87		MCARD_RI0_L	MCARD_FAN_SEL3_L		88	
PORT	89		MCARD_RXD0	GND		90	
	91		MCARD_TXD0	MCARD_RXD_SOL		92	SOL
	93		MCARD_CTS0_L	MCARD_TXD_SOL		94	
	95		MCARD_RTS0_L	GND		96	
	97		GND	FAULT_LED_L		98	LED
DEBUG	99		DEBUG_PWR0	CHASSIS_ID_L		100	
	101		DEBUG_PWR1	GND		102	
	103		GND	USB_P		104	USB
	105		MCARD_ID0	USB_N		106	
ID	107		MCARD_ID1	GND		108	
	109		MCARD_ID2	MCARD_PWRBTN_L		110	
	111		GND	MCARD_RSTBTN_L		112	BTN
	113		DEBUG_IF4	MCARD_NMIBTN_L		114	
DEBUG	115		DEBUG_IF5	GND		116	
	117		DEBUG_IF6	MCARD_AUX_SOL_CTRL_L		118	SOL CTRL
	119		DEBUG_IF7	RSVD		120	
	121		GND	GND		122	
	123		MCARD_LOCAL_LOCK_L	MCARD_RXD1		124	
CTRL	125		MCARD_SYS_S	MCARD_TXD1		126	ICMB

			PKR_DATA				
	127		MCARD_CLR_CMOS_L	MCARD_TXD1_ENABLE		128	
	129		GND	GND		130	
MISC	131		CLK_32768	ALL_PWROK		132	
	133		GND	SYS_THERMTRIP_L		134	
CARD	135		MCARD_DETECT_L	SYS_INTRUDER_L		136	
	137		GND	SYS_LINE_AC_L		138	
	139		ACOMP_ADC0	SYS_PWRBTN_L		140	STAT
	141		ACOMP_ADC1	SYS_RSTBTN_L		142	
SENS	143		ACOMP_ADC2	SYS_NMIBTN_L		144	
	145		ACOMP_ADC3	SYS_SMI_L		146	
	147		ACOMP_ADC4	SYS_PCI_RST		148	
	149		ACOMP_ADC5	SYS_ACPI_STATE0		150	
	151		GND	SYS_ACPI_STATE1		152	
CTRL	153		MCARD_SCI_INT_L	SYS_ACPI_STATE2		154	
	155		RSVD	SYS_IO_EXP_INT_L		156	
	157		GND	GND		158	
	159		RSVD	RSVD		160	
	161		RSVD	RSVD		162	
	163		RSVD	RSVD		164	
	165		RSVD	RSVD		166	
	167		GND	GND		168	
	169		GND	MCARD_TX_H		170	
	171		VDD_3.3_DUAL	MCARD_TX_L		172	
	173		VDD_3.3_DUAL	GND		174	
POWER	175		VDD_3.3_DUAL	MCARD_RX_H		176	
	177		VDD_3.3_DUAL	MCARD_RX_L		178	LAN
	179		GND	POE_GND		180	
	181		GND	POE_PWR		182	
	183		VDD_5_DUAL	POE_PWR		184	
	185		VDD_5_DUAL	POE_GND		186	
	187		RSVD	LAN_BUSY_LED_L		188	
	189		RSVD	LAN_LINK_LED_L		190	
	191		RSVD	GND		192	
	193		RSVD	RSVD		194	
	195		RSVD	GND		196	
	197		GND	RSVD		198	
	199		RSVD	GND		200	

Appendix B: OPMA Signals grouped by Function

This table lists the signals that comprise the OPMA interface. You may also find this table from OPMA spec.
http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_8796_12498,00.html

Signal Group	Signal Name	Signal Function	I/O	Signal Termination on MB *
LED Control	FAULT_LED_L	Fault LED control	O	4.7k PU to +3.3V
	CHASSIS_ID_L	Chassis identification LED control	O	4.7k PU to +3.3V
USB	USB_P	USB Differential Pair	I/O	N/A
	USB_N			
Buttons	MCARD_PWRBTN_L	MCard remote system power button	O	4.7k PU to +3.3V
	MCARD_RSTBTN_L	MCard remote system reset button	O	4.7k PU to +3.3V
	MCARD_NMIBTN_L	MCard remote system NMI button	O	4.7k PU to +3.3V
Video Capture DVI-I	DVI_TX0_H	TMDS differential pair; channel 0	I/O	N/A
	DVI_TX0_L			
	DVI_TX1_H	TMDS differential pair; channel 1	I/O	N/A
	DVI_TX1_L			
	DVI_TX2_H	TMDS differential pair; channel 2	I/O	N/A
	DVI_TX2_L			
	DVI_TX_CLK_H	TMDS differential pair; clock	I/O	N/A
	DVI_TX_CLK_L			
	DVI_DDC_DATA	Data signal for DDC interface	I/O	4.7k PU to +3.3V
	DVI_DDC_CLK	Clock signal for DDC interface	I/O	4.7k PU to +3.3V
	ANALOG_DDC_DATA	Data signal for Analog VGA interface	I/O	4.7k PU to +3.3V
	ANALOG_DDC_CLK	Clock signal for Analog VGA interface	I/O	4.7k PU to +3.3V
	ANALOG_RED	Red for Analog VGA interface	I	N/A
	ANALOG_GREEN	Green for Analog VGA interface	I	N/A
	ANALOG_BLUE	Blue for Analog VGA interface	I	N/A
	ANALOG_HSYNC	Horizontal sync for Analog VGA interface	I/O	N/A
	ANALOG_VSYNC	Vertical sync for Analog VGA interface	I/O	N/A
Multi-Bank Fan Control	MCARD_FAN_PWM_CPU	mCard PWM CPU fan control	O	3.3V signal level
	MCARD_FAN_PWM_SYS	mCard PWM system fan control	O	3.3V signal level
	MCARD_FAN_PWM_PS	mCard PWM power supply fan control	O	3.3V signal level
Multiplexed Fan Tachometers	MCARD_FAN_TACH0	Multiplexed fan tach input 0	I	4.7k PU to +3.3V
	MCARD_FAN_TACH1	Multiplexed fan tach input 1	I	4.7k PU to +3.3V
	MCARD_FAN_TACH2	Multiplexed fan tach input 2	I	4.7k PU to +3.3V
	MCARD_FAN_TACH3	Multiplexed fan tach input 3	I	4.7k PU to +3.3V
Fan Tachometer Mux Controls	MCARD_FAN_ SEL0_L	Multiplexed fan tach mux control 0	O	4.7k PU to +3.3V
	MCARD_FAN_SEL1_L	Multiplexed fan tach mux control 1	O	4.7k PU to +3.3V
	MCARD_FAN_ SEL2_L	Multiplexed fan tach mux control 2	O	4.7k PU to +3.3V
	MCARD_FAN_ SEL3_L	Multiplexed fan tach mux control 3	O	4.7k PU to +3.3V

Signal Group	Signal Name	Signal Function	I/O	Signal Termination on MB *
Single Wire Analog Sensors	ACOMP_ADC0	Analog voltage input 0	I	N/A
	ACOMP_ADC1	Analog voltage input 1	I	N/A
	ACOMP_ADC2	Analog voltage input 2	I	N/A
	ACOMP_ADC3	Analog voltage input 3	I	N/A
	ACOMP_ADC4	Analog voltage input 4	I	N/A
	ACOMP_ADC5	Analog voltage input 5	I	N/A
MCARD Serial Port	MCARD_DTR0_L	Data Terminal Ready for Serial Port 0	O	N/A
	MCARD_DCD0_L	Data Carrier Detect for Serial Port 0	I	N/A
	MCARD_DSR0_L	Data Set Ready for Serial Port 0	I	N/A
	MCARD_RI0_L	Ring Indicator for Serial Port 0	I	N/A
	MCARD_RXD0	Receive Data for Serial Port 0	I	N/A
	MCARD_TXD0	Transmit Data for Serial Port 0	O	N/A
	MCARD_CTS0_L	Clear to Send for Serial Port 0	I	N/A
	MCARD_RTS0_L	Request to Send for Serial Port 0	O	N/A
ICMB	MCARD_RXD1	Receive Data for ICMB	I	N/A
	MCARD_TXD1	Transmit Data for ICMB	O	N/A
	MCARD_TXD1_EN	Transmit Data Enable for ICMB	O	N/A
Serial Port for Serial Over LAN	MCARD_RXD_SOL	Receive Data for Serial Over LAN	I	N/A
	MCARD_TXD_SOL	Transmit Data for serial over LAN	O	N/A
	MCARD_AUX_SOL_CTRL_L	Serial Port handshake signal mux control	O	4.7k PU to +3.3V
Management Ethernet	MCARD_TX_H	Transmit Differential Pair	O	N/A
	MCARD_TX_L			
	MCARD_RX_H	Receive Differential Pair	I	N/A
	MCARD_RX_L			
	POE_PWR	Power over Ethernet positive DC supply	I	N/A
	POE_PWR			
	POE_GND	Power over Ethernet negative return	O	N/A
	POE_GND			
	LAN_BUSY_LED_L	Busy LED	O	N/A
	LAN_LINK_LED_L	Link LED	O	N/A
Interface Type ID	INTERFACE_ID0	Binary encoded interface type identification number	O	4.7k PU to +3.3V
	INTERFACE_ID1			
	INTERFACE_ID2			
Card Detect	MCARD_DETECT_L	Indicates presence/absence of mCard	O	4.7k PU to +3.3V
Status	ALL_PWROK	Indicates all the voltage rails are good	I	4.7k PU to +3.3V
	SYS_INTRUDER_L	Indicates intrusion on the system	I	10k PU to +3.3V
	SYS_THERMTRIP_L	System thermal trip alert signal	I	4.7k PU to +3.3V
	SYS_LINE_AC_L	Line AC present signal	I	4.7k PU to +3.3V
	SYS_PWRBTN_L	Indicates status of system power button	I	3.3V thru switch
	SYS_RSTBTN_L	Indicates status of system reset button	I	3.3V thru switch
	SYS_NMIBTN_L	Indicates status of system NMI button	I	3.3V thru switch

Signal Group	Signal Name	Signal Function	I/O	Signal Termination on MB *
Status (cont.)	SYS_SMI_L	Motherboard SMI status.	I	4.7k PU to +3.3V
	SYS_PCI_RST_L	Motherboard reset status	I	4.7K PU to +3.3V
	SYS_ACPI_STATE0	Binary encoded indication of the current system ACPI sleep state (S0, S1, S2, S3, S4/S5)	I	4.7k PU to +3.3V
	SYS_ACPI_STATE1		I	4.7k PU to +3.3V
	SYS_ACPI_STATE2		I	4.7k PU to +3.3V
	SYS_SMBUS_IO_EXP_INTR_L	Interrupt from SMBus-based I/O expander	I	4.7k PU to +3.3V
Control	MCARD_CLR_CMOS_L	mCard system CMOS clear control	O	4.7k PU to +3.3V
	MCARD_LOCAL_LOCK_L	mCard local lock out control	O	4.7k PU to +3.3V
	MCARD_SYS_SPKR_DATA	mCard system speaker control	O	N/A
	MCARD_SCI_INT_L	mCard SCI to the system chipset	O	4.7k PU to +3.3V
I^2C or SMBus X 5	MCARD_I2C_IPMB_SCL	I^2C clock for the IPMB bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_IPMB_SDA	I^2C data for the IPMB bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_SIDEBAND_NIC_SCL	I^2C clock for the NIC sideband bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_SIDEBAND_NIC_SDA	I^2C data for the NIC sideband bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_SIDEBAND_NIC_ALERT	Alert signal from the NIC for I^2C traffic	I/O	4.7k PU to +3.3V
	MCARD_I2C_PRIVATE0_SCL	I^2C clock for mCard private 0 I^2C bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_PRIVATE0_SDA	I^2C data for mCard private 0 I^2C bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_PRIVATE1_SCL	I^2C clock for mCard private 1 I^2C bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_PRIVATE1_SDA	I^2C data for mCard private 1 I^2C bus	I/O	4.7k PU to +3.3V
	MCARD_I2C_SHARED_SCL	mCard shared host device I^2C clock	I/O	4.7k PU to +3.3V
	MCARD_I2C_SHARED_SDA	mCard shared host device I^2C data	I/O	4.7k PU to +3.3V
LPC	LAD0	LPC address-data bus	I/O	10k PU to +3.3V
	LAD1			
	LAD2			
	LAD3			
	LFRAME_L	LPC frame signal	I	N/A
	LRST_L	LPC reset for mCard LPC interface	I	N/A
	LDRQ_L	LPC DMA request signal	O	10k PU to +3.3V
	SERIRQ	Serialized IRQ signal	I/O	N/A
	LCLKRUN_L	Clock run (same as PCI CLKRUN#)	O	10k PU to +3.3V
	LCLK	LPC clock signal	I	N/A
Misc	CLK_32768	32.768-KHz clock signal	I	N/A
Debug Interface	DEBUG_IF0	Firmware debugger probe signals	I/O	N/A
	DEBUG_IF1			
	DEBUG_IF2			
	DEBUG_IF3			
	DEBUG_IF4			
	DEBUG_IF5			
	DEBUG_IF6			
	DEBUG_IF7			
Debug Power	DEBUG_PWR0	Firmware debugger probe power	I	N/A
	DEBUG_PWR1			

Signal Group	Signal Name	Signal Function	I/O	Signal Termination on MB *
mCard Power and Ground	VDD_3.3_DUAL	3.3V supplied in all sleep modes	I	N/A
	VDD_3.3_DUAL			
	VDD_3.3_DUAL			
	VDD_3.3_DUAL			
	VDD_5_DUAL	5V supplied in all sleep modes	I	
	VDD_5_DUAL			

Note:

** Signal level terminations on the motherboard. PU – Refers to pull-up. The pull-up resistor values indicated in the signal termination column are suggested values. Motherboard designers must take their circuit and the type of I/O on the motherboard (e.g., push-pull, open-drain, etc.) into consideration while designing the values for the pull-ups.*

Compatibility Note: For consistency going forward, this version of the specification terminates all pull-ups to the +3.3VDC rail whereas earlier versions of the specification terminated some of these signals to the +5VDC rail. This specification is backward-compatible with motherboards that are compliant to the earlier termination specification.

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